

# **TMDLS FOR LAKES LISTED FOR MERCURY IN FISH TISSUE FOR THE OUACHITA RIVER BASIN, ARKANSAS**

**DRAFT**  
**November 20, 2003**

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Prepared for

US Environmental Protection Agency Region VI  
Watershed Management Section  
Dallas, TX 75202

Prepared by

FTN Associates, Ltd.  
3 Innwood Circle, Suite 220  
Little Rock, AR 72211

DRAFT  
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## EXECUTIVE SUMMARY

The Arkansas 2002 Section 303(d) List includes three lakes in the Ouachita River basin that are impaired due to excess concentrations of mercury in fish. While there have been no known violations of the numeric mercury water quality standard and fishable designated use for these water bodies, these lakes are not meeting the narrative water quality standard and designated uses of fishable water bodies. A basin-wide approach is being used in this TMDL due to similar ecoregions and watershed characteristics and because of similar causative factors such as atmospheric and geologic contributions.

The Ouachita River basin is in the Ouachita Mountain, South Central Plain, and Mississippi Alluvial Plain ecoregions. It has gently rolling topography, with hilly uplands, flat wooded uplands, terraces, and floodplains. Land use in the basin is 71% forest with 13% in wetlands. There is one NPDES point source with permit mercury limits in the basin. There are seven air emission point sources with permit mercury limits. The geology of the Ouachita Mountains contains rocks with relatively high, naturally occurring mercury concentrations. The soils in the basin reflect this geology and also receive mercury from atmospheric deposition.

Arkansas has a numeric mercury water quality standard of  $0.012 \mu\text{g/L}$ . There have been no known violations of the numeric water quality standard, but clean sampling procedures and ultra-trace level analyses have not been used. There are fish consumption advisories throughout the lower Ouachita River basin in both Arkansas and Louisiana because of mercury contamination of fish. The Mercury Action Level in Arkansas for fish consumption advisories is  $1 \text{ mg/kg}$ . The target mercury level for total mercury for all fish species in this TMDL is  $0.8 \text{ mg/kg}$ , using a 20% Margin of Safety (MOS) for the Action Level.

The TMDL was developed using a two-step approach. The first step estimated the mercury loads from the NPDES facility with a mercury permit limit, municipal wastewater treatment facilities, local emission point sources, regional atmospheric deposition, watershed nonpoint sources, and natural background. In the second step, maximum and average largemouth bass tissue mercury concentrations measured in the lakes were used to estimate the reduction in fish tissue mercury needed to achieve the target levels. A linear relationship was assumed between mercury in fish and

mercury loading to the basin. The reduction factor to achieve target fish tissue mercury levels was then used to determine the reduction needed in basin mercury loading.

The predominant sources of mercury loading to the Ouachita River basin are from atmospheric deposition and watershed nonpoint source and background loads. Less than 1% of the load came from the point source wasteloads. Reduction factors to reduce fish tissue concentrations to target levels ranged from 1.3 to 2.2. Target mercury loads to achieve the target fish tissue mercury levels ranged from 47,024 g/yr to 589,315 g/yr. Estimated reductions in mercury loading to the Ouachita River basin as a result of implementation of mercury emission regulations and erosion BMPs were calculated. These reductions were predicted to achieve the mercury target loads based on largemouth bass tissue mercury meeting the target fish tissue mercury levels.

This TMDL was developed using the best available information on mercury levels in the environment and waste streams, and current water quality standards. This TMDL may need to be revised in the future as new information becomes available that would have a bearing on the assumptions on which this TMDL is based.

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## 1.0 INTRODUCTION

The Arkansas 2002 Section 303(d) List included three lakes impaired due to excess concentrations of mercury in fish within the Ouachita River watershed for which TMDLs had not been developed. Table 1.1 (all tables and figures are located at the end of their respective chapter) identifies the lakes not included in previous TMDLs that are on the 303(d) List due to elevated mercury in fish.

For consistency with previously developed fish tissue mercury TMDLs in the Ouachita River basin, and because of similar ecoregion and watershed characteristics, and potentially similar causative factors such as atmospheric and geologic contributions, the TMDL development is based on a basin-wide approach to the Ouachita River watershed. For this TMDL, the Ouachita River basin has been defined to include the Ouachita River, Saline River, Bayou Bartholomew, and their tributaries located within the hydrologic unit codes (HUC) 08040201, 08040202, 08040203, 08040204, 08040205, and 08040207 (Figure 1.1). This is the same basin that was used for the previous fish tissue mercury TMDLs in the Ouachita River basin.

This watershed is of critical concern because of litigation over the 303(d) process in Arkansas and the pervasiveness of mercury contamination. While there have been no known violations of the numeric water quality standard and the fishable designated use for these water bodies, these lakes are not meeting the narrative water quality standard and designated uses of fishable water bodies. Therefore, development of a TMDL is required. This TMDL is being conducted under EPA Contract #68-C-02-108, Work Assignment #0-19.

Table 1.1. Lakes in the Ouachita River basin on 303(d) List.

Waterbody Name	HUC	On 303(d) List	Fish Consumption Advisory	Priority
Big Johnson	08040202	Yes	Yes	High
Grays Lake	08040204	Yes	Yes	High
Lake Monticello	08040204	Yes	Yes	Low

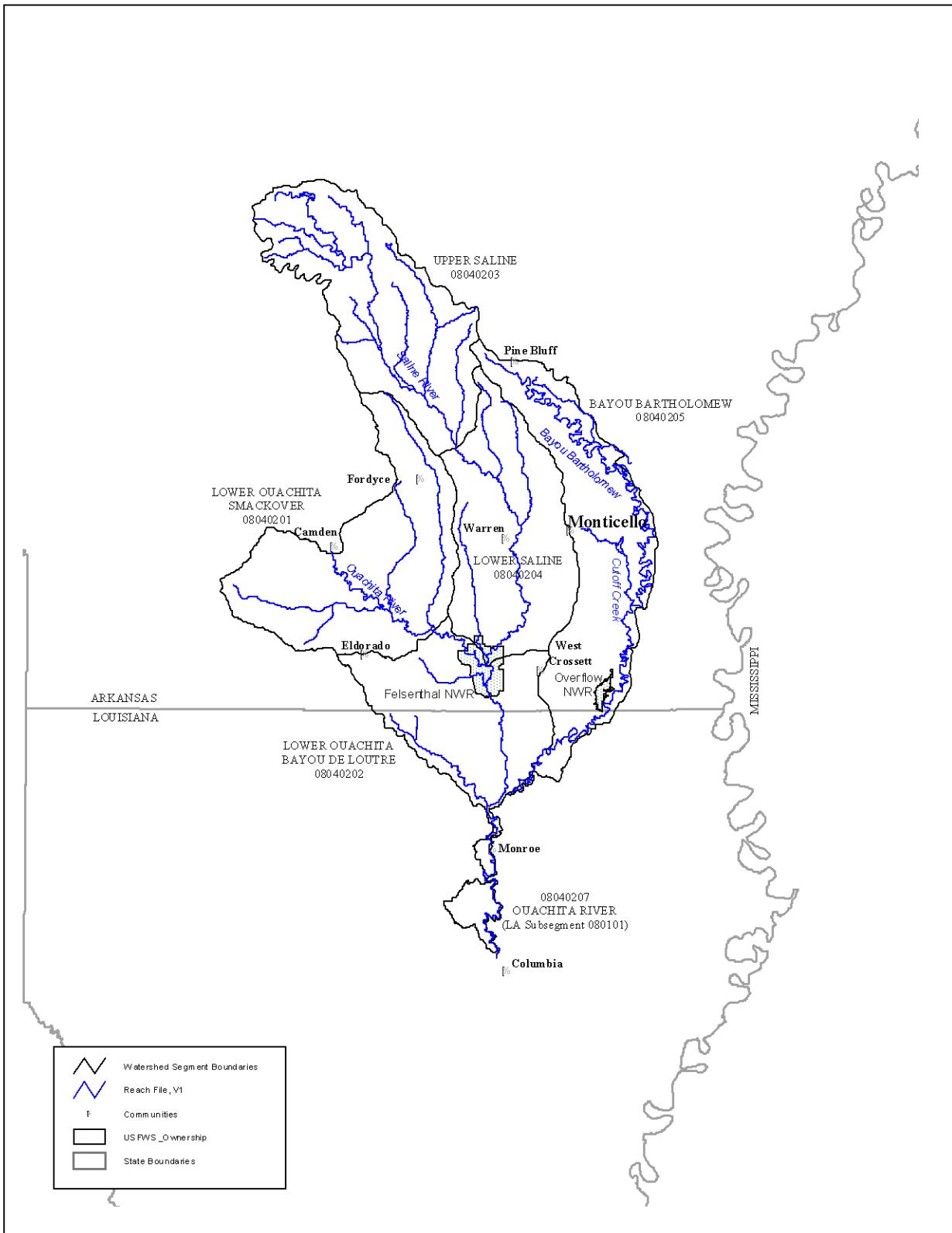


Figure 1.1. Drainage basin for the study area.

## 2.0 DESCRIPTION OF BASIN

### 2.1 Ecoregions

The Ouachita River basin includes portions of the Ouachita Mountain, South Central Plain, and Mississippi Alluvial Plain ecoregions (Omernick 1987). The Saline River and Ouachita River headwaters are in the Ouachita Mountain ecoregion and arise in the Ouachita Mountains of west central Arkansas (Figure 2.1). The upper section of each river drains a portion of the Ouachita Mountains, which are composed mostly of sandstone and shale. Near Malvern, Arkansas, the Ouachita River enters the South Central Plain ecoregion where the character of the river changes. Here the river gradient decreases significantly, and the river gradually changes into more of a lowland stream (lower riffle to pool ratio) (Figure 2.2). The Saline River enters the South Central Plain ecoregion near Benton, Arkansas, where the character of the river has similar changes to those of the Ouachita River.

The headwaters of Bayou Bartholomew begin northwest of Pine Bluff, Arkansas in the Mississippi Alluvial Plain ecoregion. Bayou Bartholomew meanders through southeast Arkansas and into northeast Louisiana before emptying into the Ouachita River near Sterlington, Louisiana. The watershed is located within both the South Central Plain and the Mississippi Alluvial Plain ecoregions.

### 2.2 Topography

The following description of the topography of the watershed was taken from county soil surveys (USDA 1958; 1967; 1968; 1972; 1973; 1976; 1979; 1980). The majority of the Ouachita and Saline Rivers watershed is in the South Central Plain ecoregion. The topography of this area can be described as nearly level or gently rolling to hilly uplands, terraces, and floodplains. Slopes are mainly 1% to 8% but can range from 0% to 20%. The Bayou Bartholomew watershed is in the Mississippi Alluvial Plain and South Central Plain ecoregions. The topography of this area can be described as level to moderately steep, with the main topographic divisions

consisting of rolling uplands, flat wooded uplands, terraces, and floodplains. Slopes are mainly 1% to 8%, but range from 0% to 20%.

### **2.3 Soils**

Soil characteristics for the watershed are also provided by the county soil surveys (USDA 1958; 1967; 1968; 1972; 1973; 1976; 1979; 1980). Most of the soils in the watershed are classified as loamy. Soil series that are common in the watershed area are Amy, Cahaba, Ouachita, Pheba, Savannah, Smithton, and Ruston. These soils are classified as silty loams or sandy loams.

### **2.4 Land Use**

Land use in the watershed is predominantly forest land (Figure 2.3). Areas and approximate percentages of each land use in the watershed are listed in Table 2.1.

Prior to development, the watershed basin was predominantly covered with thick growths of hardwoods and pines. Only a small part of the basin was prairie. As settlers arrived in the early 1800s, agriculture grew steadily until the outbreak of World War II, and then declined. In the 1930s, reforestation efforts were begun to restore once cleared land to woodland. Lumbering has become the chief source of income. Much of the forested land is managed for the production of pulpwood, poles, and saw logs.

Farming practices are fairly uniform throughout the basin. Rice and cotton are typically planted in April through May and soybeans are planted later in May through June. Wheat is planted in October and November. Irrigation is primarily by flooding. Rice is flooded in May, soybeans are irrigated in June through July, and cotton is irrigated in July. Rice fields are typically drained in late August through September. Much of the crop land is bare from November through March.

### **2.5 Description of Hydrology**

USGS daily stream flow data were retrieved for gages on the Ouachita River near Camden, Arkansas; on the Saline River near Rye, Arkansas; on Bayou Bartholomew near Garrett Bridge, Arkansas; and on the Ouachita River at the Arkansas/Louisiana state line. Basic information and summary statistics for these gages are summarized in Table 2.2.

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Average annual precipitation for the watershed is approximately 54 inches (Hydrosphere 2000). Mean monthly precipitation totals for the watershed are shown on Figure 2.4. The mean monthly precipitation values are highest for March and lowest for July. Precipitation data from three stations within each of the five HUCs was used to calculate the annual and monthly mean precipitation for the watershed.

## 2.6 Point Sources

Information on NPDES point source discharges in the watershed was obtained by searching the Permit Compliance System (PCS) on the EPA website. The PCS search identified a total of 176 facilities with NPDES permits within the watershed. Of these 176 permitted facilities, 43 were city municipal wastewater treatment plants (WWTPs). ENSCO, Inc. (NPDES permit no. AR0037800) located in Union County was the only facility that was identified as having an NPDES permit limit for mercury. ENSCO has a facility flow rate of 1.29 MGD and a permit limit of 0.2  $\mu\text{g}/\text{L}$  for total recoverable mercury. None of the other NPDES facilities had permit mercury limits. However, ADEQ used clean sampling procedures and ultra-trace level analyses to sample for mercury in five municipal WWTPs in Arkansas during 1995 (Allen Price, personal communication 2001). The average mercury concentration for these WWTPs was 0.015  $\mu\text{g}/\text{L}$ . Clean sampling procedures and ultra trace level analyses have not been used to sample any other types of facilities, so no information is available on mercury for these facilities. A listing of the NPDES permitted facilities is included in Appendix A.

Information on local air emission sources in the airshed (airshed is defined as all counties within 100 km of the Ouachita River watershed boundary) was obtained by searching the 1999 National Emissions Inventory (NEI) on the EPA website. The NEI includes point sources, area sources, and mobile sources. A search was done of the maximum achievable control technology (MACT) source category, which includes the number of sources and total hazardous air pollutant (HAP) emissions for each MACT source category included in the NEI. The database search for the airshed resulted in about 1,000 air emission sources in nine MACT source categories. The MACT standards are emission limitations developed under Section 112(d) of the Clean Air Act (National Emissions Standards for Hazardous Air Pollutants). The limitations are based on the best demonstrated control technology or practices in similar sources to be applied to major sources

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emitting one or more of the listed toxic pollutants. A listing of the air emission sources of mercury is included in Appendix B.

Table 2.1. Acreage and percent of land use categories in the Ouachita River basin.

Land Use	10 <sup>6</sup> Acres (mi <sup>2</sup> )	Percent
Forest	3.62 (5,657)	70.5
Pasture	0.4 (635)	7.9
Cropland	0.33 (514)	6.4
Wetland (forest/nonforested)	0.66 (1,026)	12.8
Water	0.02 (32)	0.4
Urban and Other	0.10 (155)	1.9
TOTAL	5.13 (8,020)	100

Table 2.2. Information for stream flow gaging stations.

	Ouachita River near Camden, Arkansas	Saline River near Rye, Arkansas	Bayou Bartholomew at Garrett Bridge, Arkansas	Ouachita River at Arkansas/Louisiana State Line
USGS gage number	07362000	07363500	07364133	07364100
Descriptive location	Ouachita County on US Highway 79 at Camden, 3.4 miles downstream from Ecore Fabre Bayou, at mile 354.1	Bradley County on State Highway 15, 3.6 miles southwest of Rye, at mile 71.0	Located in Lincoln County on downstream side of bridge on State Hwy 54, 1.9 miles upstream from Flat Creek at Garrett Bridge	Union City near Arkansas/Louisiana state line
Drainage area (mi <sup>2</sup> )	5,357	2,102	380	10,787
Period of record	Oct. 1928 to Sept. 2002	Oct. 1937 to Sept. 2002	Oct. 1987 to Sept. 2002	April 1958 to Sept. 2002
Mean flow (cfs)	7,706	2,619	548	4,581
Minimum flow (cfs)	125	4	0.3	190
Maximum flow (cfs)	243,000	14,500	5,220	19,200
Flow (cfs) that is exceeded:				
80% of the time	791	65	16	1,500
50% of the time	3,460	679	197	3,020
20% of the time	19,400	7,470	1,600	7,250

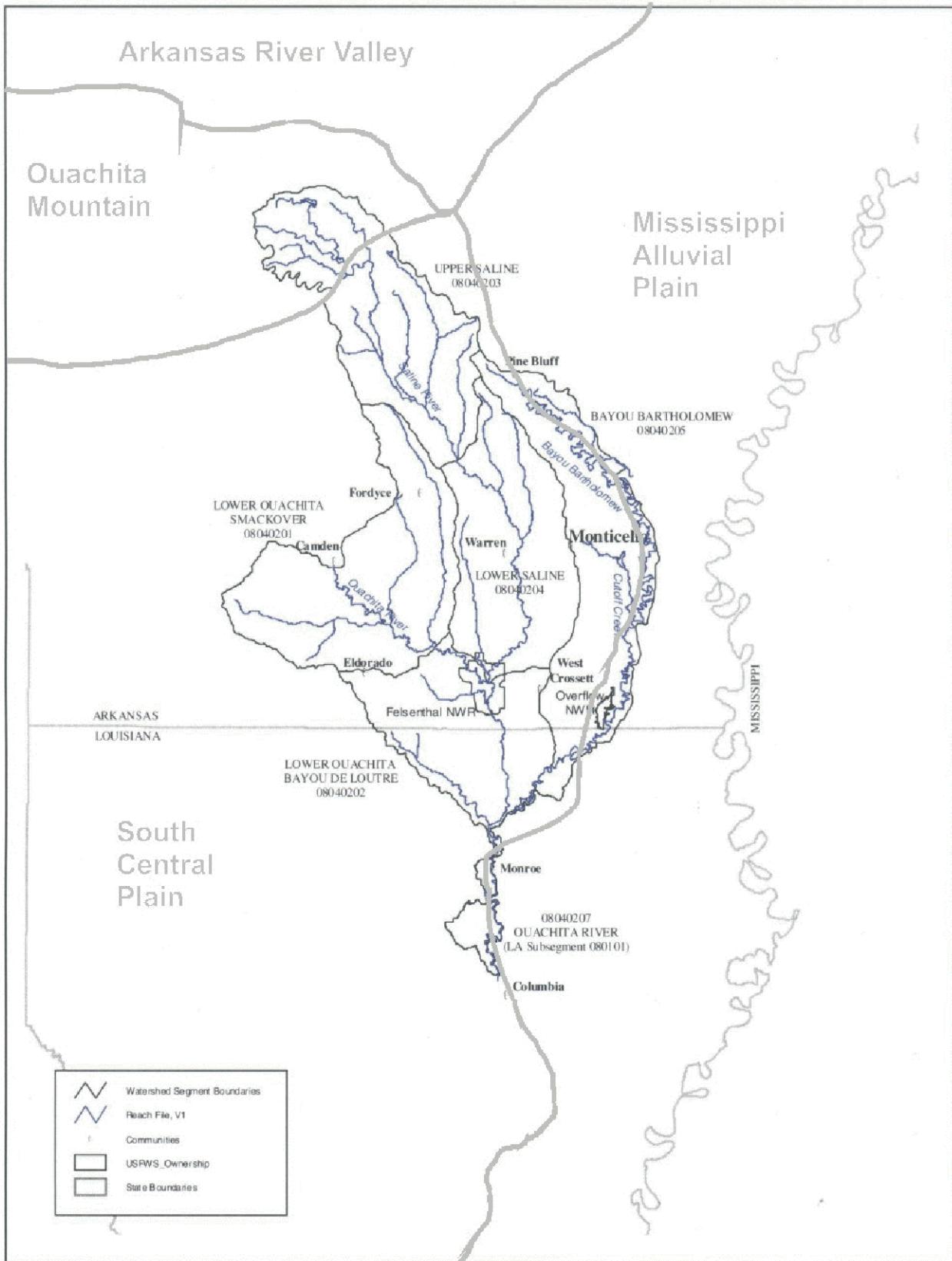


Figure 2.1. Ouachita River basin and associated HUC codes included in the TMDL

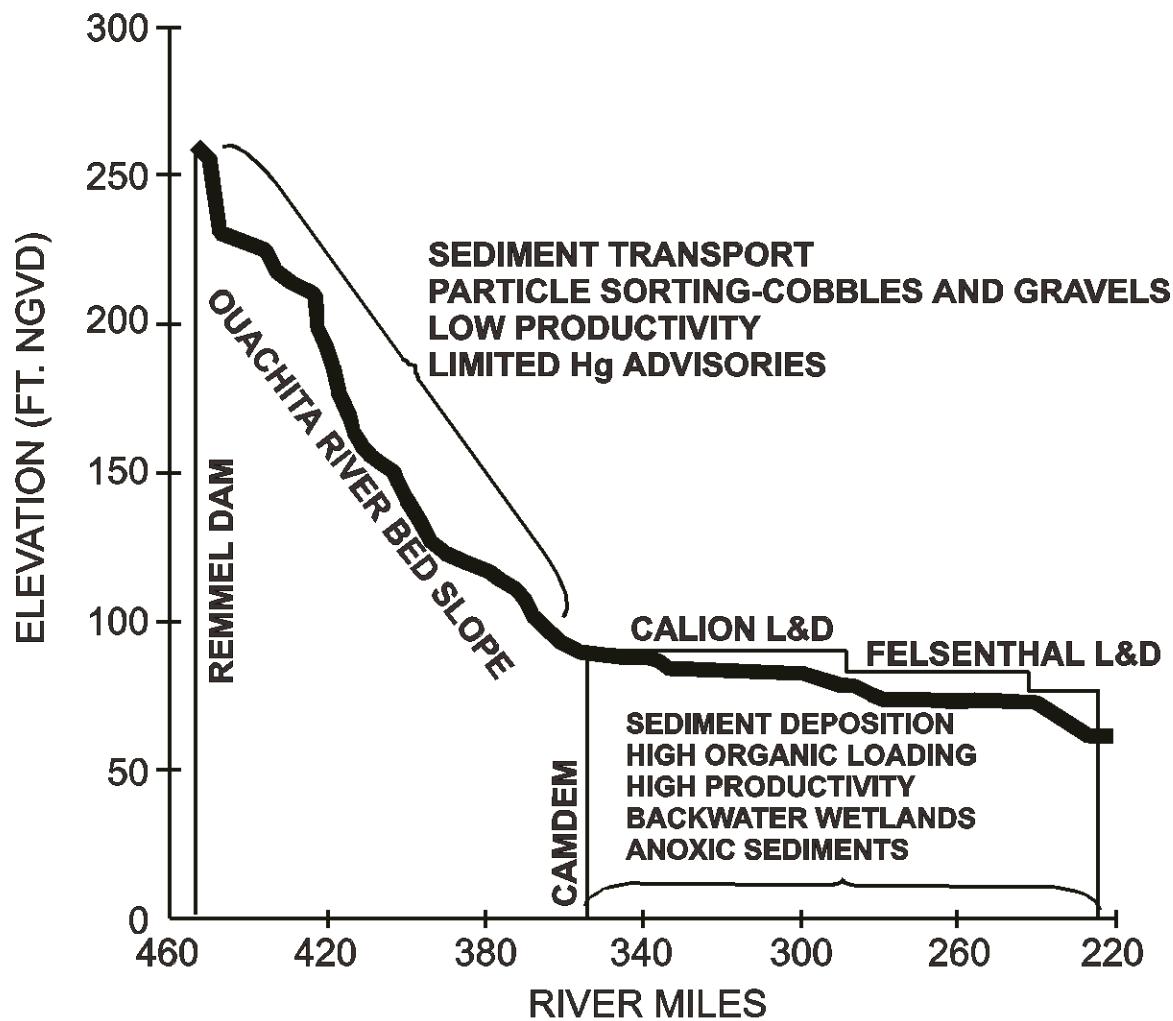


Figure 2.2. Differences in stream characteristics above and below Camden, which is the general vicinity where consumption advisories begin in the southern half of the state.

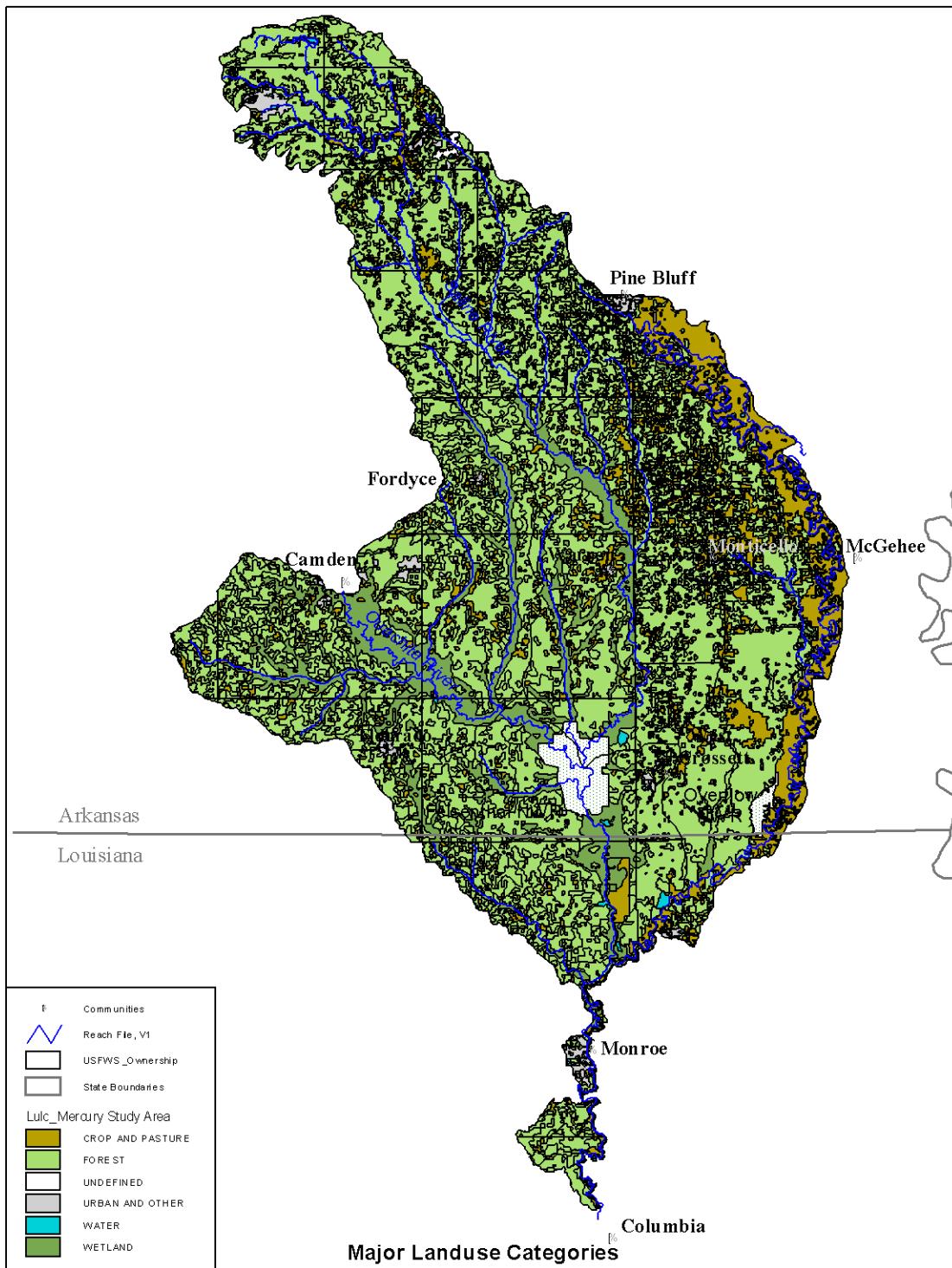


Figure 2.3. Land use within the Ouachita River basin.

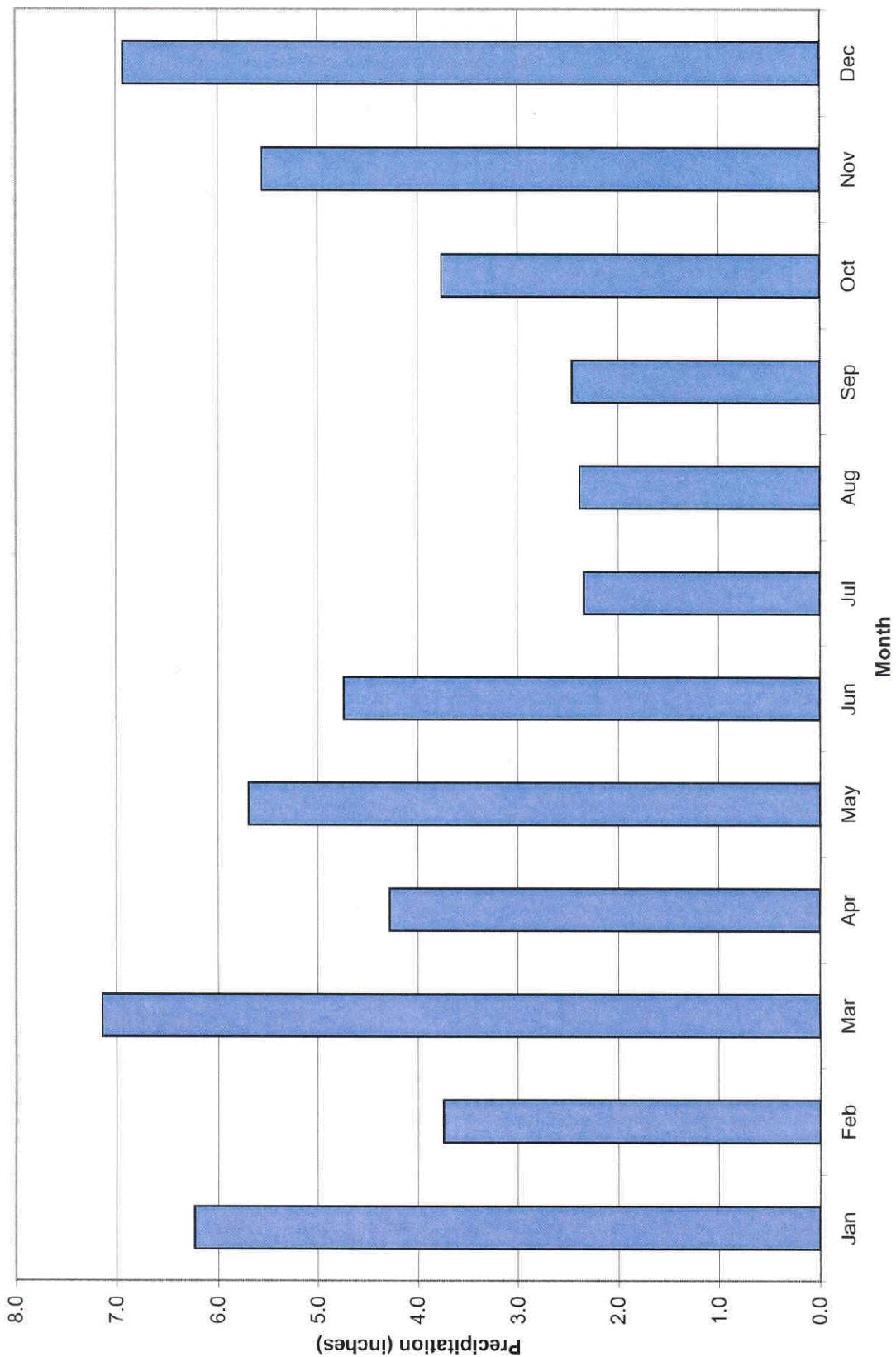


Figure 2.4. Mean monthly precipitation.

### **3.0 WATER QUALITY STANDARDS AND EXISTING WATER QUALITY CONDITIONS**

#### **3.1 Water Quality Standards and Fish Tissue Action Levels**

The State of Arkansas has developed water quality standards for waters of the State (ADEQ 2002). The standards are defined according to ecoregions and designated uses of the waterbodies. The Ouachita River basin lies within three ecoregions: the Ouachita Mountain ecoregion, the South Central Plain ecoregion, and the Mississippi Alluvial Plain ecoregion. Designated uses for the Ouachita River basin from Remmel Dam to the Arkansas State Line include primary and secondary contact recreation; protection and propagation of fisheries, shellfish and other forms of aquatic life; and domestic, industrial and agricultural water supply. Some waterbodies within the Ouachita basin are also designated as extraordinary resource waters, natural and scenic waterways, and ecologically sensitive waterbodies. The mercury water quality standard for Arkansas waters for all ecoregions is 0.012 µg/L, expressed as total recoverable mercury. Although this water quality standard is to protect aquatic life, it was developed to protect humans from consuming aquatic life contaminated by mercury. There is no correction factor for hardness or other constituent concentrations. The narrative standard for toxic substances in Section 2.508 (Regulation No. 2, ADEQ 1998) is “Toxic substances shall not be present in receiving waters, after mixing, in such quantities as to be toxic to human, animal, plant, or aquatic life or to interfere with the normal propagation, growth, and survival of the indigenous aquatic biota.” The fish consumption Action Level in Arkansas is based on the FDA Action Level of 1.0 mg/kg (wet weight).

This TMDL uses fish tissue monitoring data as a means to determine whether the “fishable” use is being met and the reductions needed to achieve the designated use. The “fishable” use is not attained if: (1) the fish and wildlife propagation is impaired and/or (2) if there is a significant human health risk from consuming fish and shellfish resources. The lakes that are the subject of this TMDL, as indicated above, were listed in the 2002 303(d) List based on elevated fish tissue mercury concentrations, and are in violation of narrative standards for toxic substances.

#### **3.2 Existing Mercury Concentrations in Water and Fish Tissue**

There have been no exceedances of the mercury water quality standard in the Ouachita River basin in Arkansas because of mercury. The analytical procedures used previously (1992-1994) had a detection limit of 0.2  $\mu\text{g}/\text{L}$  and all samples were less than the detection limit. No more recent analysis of mercury in ambient water has been performed (Allen Price, ADEQ, personal communication October 6, 2003). Currently, the waterbody concentrations of mercury and methyl mercury are unknown. In the future, clean sampling and analysis procedures might facilitate the estimation of loading through water column monitoring.

Fish were collected by the Arkansas Game and Fish Commission per EPA (1995) from 1993 through 1999 throughout the Ouachita River basin, including the Ouachita River and its tributaries and lakes within the basin (Armstrong et al. 1995; Nat Neheus, ADEQ, personal communication August 29, 2003). Fish mercury concentrations are summarized in Table 3.1 and shown on Figure 3.1. Fish consumption advisories are in place for mercury contamination in portions of the Ouachita River basin based on the FDA guideline of 1 mg/kg. The locations of these fish consumption advisories are shown on Figure 3.1.

### **3.3 Additional Water Quality Data**

Additional water quality data were obtained from the EPA STORET system. The stations, agency code, HUC, and period of record (POR) for this study are listed in Table 3.2. Water quality data are also summarized on Figures 3.2 through 3.4 for sulfate, total organic carbon (TOC), and pH. These three constituents have been demonstrated to be correlated with fish mercury concentrations and can affect the bioaccumulation and bioavailability of mercury for methylation and subsequent uptake of methylmercury through the food chain (Armstrong et al. 1995, EPA 1998). The overlapping ranges of moderate sulfate and TOC concentrations with lower pH values in the lower portion of the Ouachita River basin provides an environment conducive to microorganisms that methylate mercury (Armstrong et al. 1995). These conditions likely contribute to the elevated fish mercury concentrations in this area. In addition, significant wetland acreage is also located in this portion of the Ouachita River basin. Wetland ecosystems have conditions that are particularly suited to organisms that methylate mercury (Rudd 1995).

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Table 3.1. Maximum fish tissue Hg concentration mg/kg (wet weight) for largemouth bass and other species of concern in the Ouachita River basin.

Station	Bass (includes largemouth and spotted bass species)	Others (includes all other species collected)	
	Max Hg Concentration mg/kg	Max Hg Concentration mg/kg	Others Common Name
BAYOU BARTHOLOMEW AT BAXTER	1.29		
BAYOU BARTHOLOMEW AT HWY 425 LA	1.39		
CALION LAKE	1.02		
CHAMPAGNOLLE CREEK	1.34	1.52	BOWFIN
CORNIE BAYOU	0.90		
DOLLAR SLOUGH AREA OF FELSENTHAL NWR	2.64	0.70	DRUM
LAKE FELSENTHAL	1.10		
LAKE WINONA	1.48		
LOWER OUACHITA RIVER ABOVE CAMDEN	0.45	<0.2	SUCKERS
LOWER OUACHITA RIVER AT DALLAS CO. ACCESS	0.55	0.29	SUCKERS
LOWER OUACHITA RIVER BELOW TWO BAYOU	0.59		
MORO CREEK ABOVE STATE PARK	1.42	1.41	SPOTTED GAR
MORO CREEK AT HWY 160	1.56	1.58	CHANNEL CATFISH
MORO CREEK AT HWY 275	0.90	1.18	BOWFIN
OUACHITA AND SALINE RIVERS NEAR CONFLUENCE	2.44	0.46	SMALLMOUTH BUFFALO
OUACHITA R- PIGEON HILL	1.40	0.40	BLACK CRAPPIE
OUACHITA R.- BELOW FELSENTHAL	1.36	1.86	FLATHEAD CATFISH
OUACHITA RIVER ABOVE CAMDEN	0.71	0.65	REDHORSE
OUACHITA RIVER- ABOVE LAPILE CREEK	0.21	0.61	BLUEGILL
OUACHITA RIVER AT CHERRY HILL ACCESS	0.89		
OUACHITA RIVER AT DALLAS CO. ACCESS	0.41	0.25	SUCKERS
OUACHITA RIVER AT GRIGSBY FORD	0.52	0.75	REDHORSE
OUACHITA RIVER BELOW HWY. 82	2.41	0.43	SMALLMOUTH BUFFALO
OUACHITA RIVER AT MCGUIRE ACCESS	0.60		
OUACHITA RIVER AT PIGEON HILL	1.10	0.80	SUCKERS
OUACHITA RIVER BELOW CALION L&D		1.38	FLATHEAD CATFISH
OUACHITA RIVER BELOW COFFEE CREEK	1.20		
OUACHITA RIVER BELOW COVE CREEK (REMMEL DAM)	0.46	0.40	GOLDEN REDHORSE

		Max Hg Concentration mg/kg	Others Common Name
OUACHITA RIVER BELOW SMACKOVER CREEK	1.13	0.52	CARP
OUACHITA RIVER BELOW TATES BLUFF	0.35	0.37	REDHORSE
OUACHITA RIVER BELOW WEST TWO BAYOU	0.70		
OUACHITA RIVER NEAR FRIENDSHIP	0.55		
OUACHITA RIVER NR ODEN	0.98		
SALINE R. BELOW L'AIGLE CREEK	1.78	1.50	CRAPPIE
SALINE RIVER - ASHLEY AND BRADLEY COUNTIES	1.70		
SALINE RIVER AT COWFORD'S ACCESS, CLEVELAND CO.	1.09	0.52	DRUM
SALINE RIVER AT HIGHWAY 4	1.72	0.91	DRUM
SALINE RIVER AT HWY. 79	0.84	0.48	BLACK CRAPPIE
SALINE RIVER AT I-30 BRIDGE	0.80		
SALINE RIVER AT JENKINS FERRY	0.78	0.72	REDHORSE
SALINE RIVER AT LEES FERRY	0.64	0.81	CHANNEL CATFISH
SALINE RIVER AT LONGVIEW ACCESS, ASHLEY CO.	0.99	1.90	DRUM
SALINE RIVER AT MT. ELBA	1.87	1.13	CHANNEL CATFISH
SALINE RIVER AT OZMENT BLUFF, DREW CO.	1.10	1.47	REDHORSE
SALINE RIVER AT PRAIRIE ISLAND ACCESS BRADLEY CO.	0.66	1.29	BLACK CRAPPIE
SALINE RIVER- FITZHUGH ACCESS	0.86	0.56	BLACK CRAPPIE
SALINE RIVER NR EAGLE CREEK, BRADLEY CO.	1.79	1.84	FLATHEAD CATFISH
SHALLOW LAKE AREA OF FELSENTHAL NWR	1.34	1.36	SPOTTED GAR
SMACKOVER CREEK	0.97	0.71	BOWFIN
WILDCAT-FELSENTHAL	1.91	1.51	BLACK CRAPPIE
OUACHITA RIVER NEAR STATE LINE	1.02	1.45	DRUM
OUACHITA RIVER NEAR STERLINGTON LA	1.24	0.92	BLACK CRAPPIE
OUACHITA RIVER NEAR RIVERTON	1.07	0.99	DRUM
OUACHITA RIVER NEAR COLUMBIA	0.37	1.56	BOWFIN
GRAYS LAKE - CLEVELAND CO.	1.78	1.18	FLATHEAD CATFISH
BIG JOHNSON LAKE - CALHOUN CO	1.71	1.17	CHAIN PICKEREL
LAKE MONTICELLO	1.93	1.4	CHANNEL CATFISH

Note: This List of stations and maximum Hg concentrations was derived from the fish tissue database provided by ADEQ.  
The data was compiled by FTN Associates.

Table 3.2. Water quality monitoring stations in the Ouachita River basin, agencies, HUC, and POR.

ID	Station	Agency	HUC	POR
50357	OUA137A	1116APCC	08040201	94-97
50039	OUA02	1116APCC	08040206	92-present
50042	OUA05	1116APCC	08040206	92-present
50046	OUA08A	1116APCC	08040202	92-present
50285	OUA08B	1116APCC	08040202	92-97
50094	OUA10A	1116APCC	08040204	92-present
50277	OUA117	1116APC	08040204	92-present
50278	OUA118	1116APCC	08040204	92-present
50358	OUA137B	1116APCC	08040201	94-97
50359	OUA137C	1116APCC	08040201	94-97
50360	OUA137D	1116APCC	08040201	94-97
50276	OUA16	1116APCC	08040203	92-present
50261	OUA18	1116APCC	08040203	92-present
50158	OUA26	1116APCC	08040203	92-present
50159	OUA27	1116APCC	08040201	92-present
50160	OUA28	1116APCC	08040201	92-present
50189	OUA37	1116APCC	08040201	92-present
50193	OUA42	1116APCC	08040203	92-present
50194	OUA43	1116APCC	08040204	92-present
50266	OUA47	1116APCC	08040201	92-present
05UWS030	UWCHCO1	21ARAPCC	08040201	94-96
B080190020	580010018	21LA10RS	08040206	92-98
S081465010	58010068	21LA10RS	08040206	92-98
S080190020	58010018	21LA10RS	08040206	92-98
B083305010	58010015	21LA10RS	08040206	92-98
50051	OUA13	1116APCC	08040205	90-98
50165	OUA33	1116APCC	08040205	90-98
05UWS036	UWBYP01	21ARAPCC	08040205	94-96
05UWS040	UWBYP02	21ARAPCC	08040205	94-98
05UWS041	UWBYP03	21ARAPCC	08040205	94-98
05UWS038	UWCOC01	21ARAPCC	08040205	94-98
05UWS039	UWCOC02	21ARAPCC	08040205	94-98

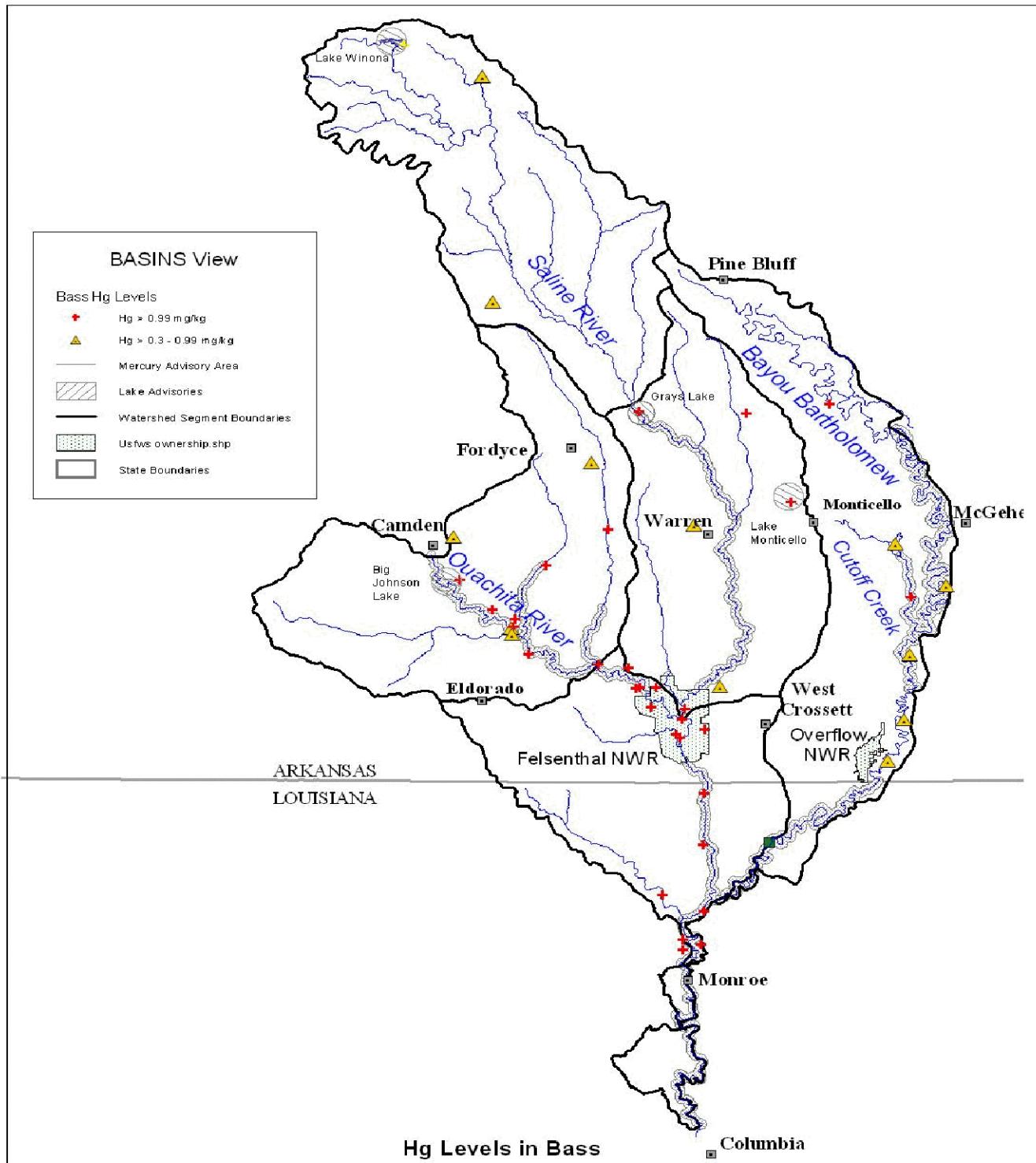


Figure 3.1. Fish consumption advisory areas in the Ouachita River basin. Maximum largemouth bass tissue mercury (Hg) concentrations for composite samples are shown on the map.

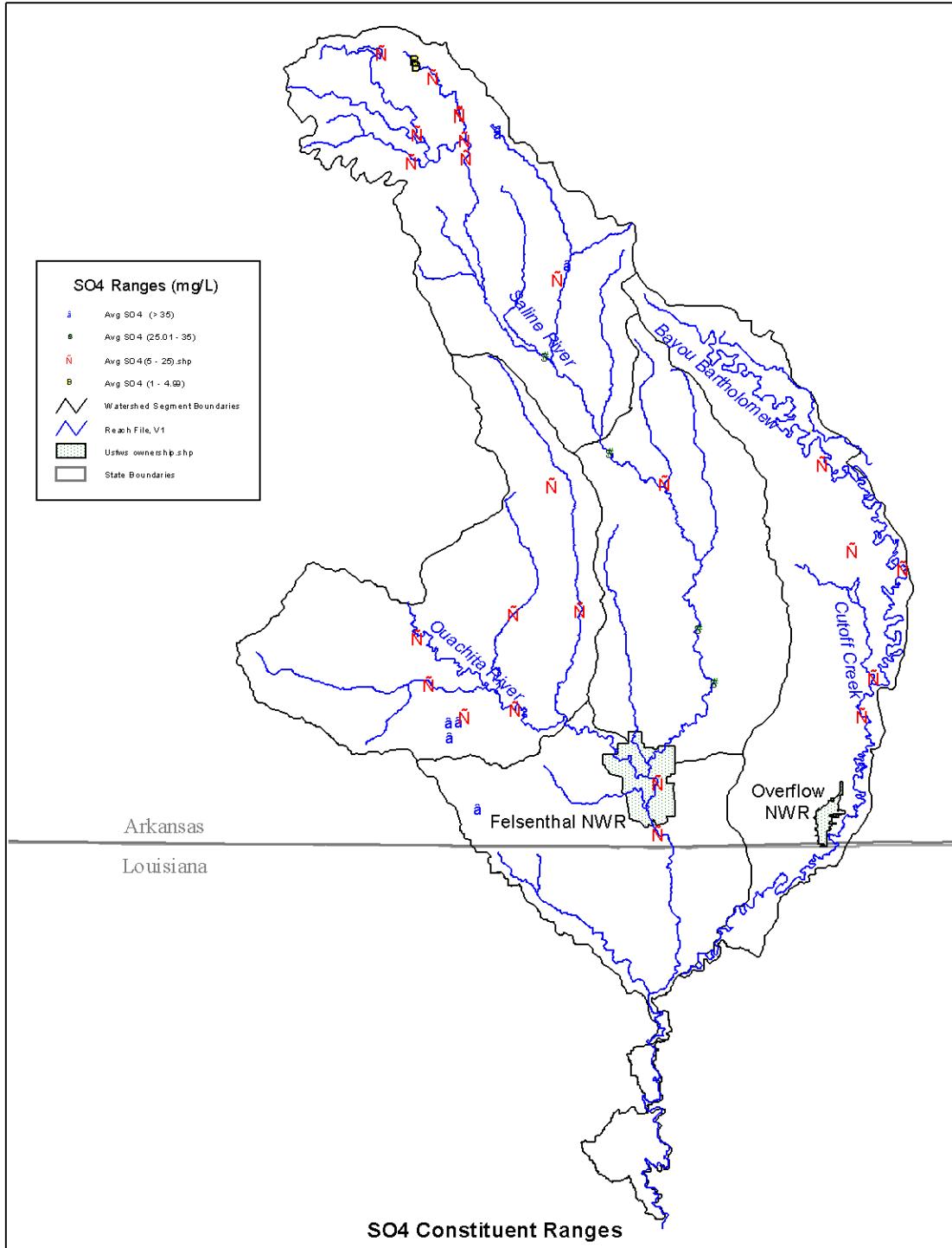


Figure 3.2. Average sulfate concentration (mg/L) ranges in the Ouachita River basin.

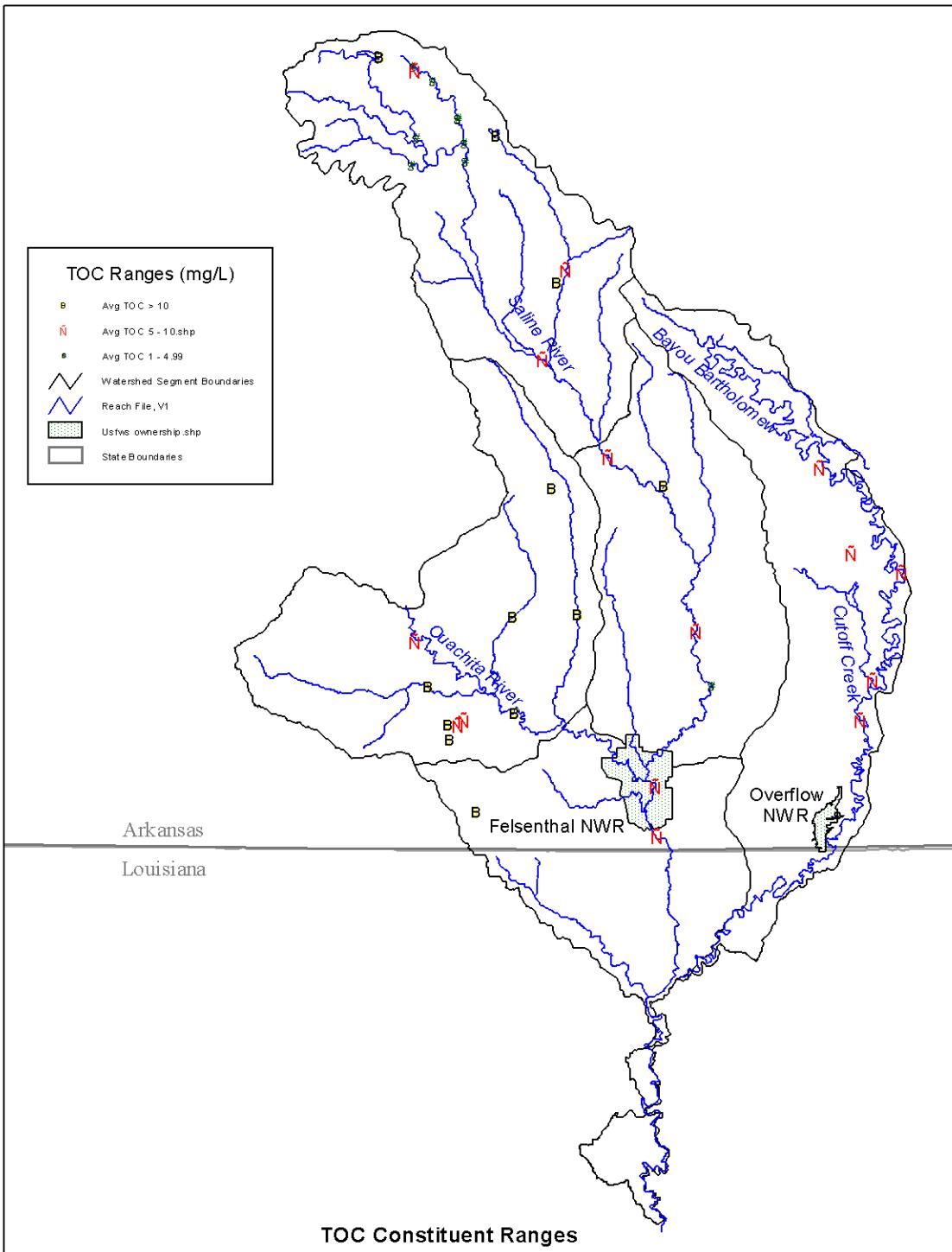


Figure 3.3. Average TOC concentration (mg/L) ranges in the Ouachita River basin.

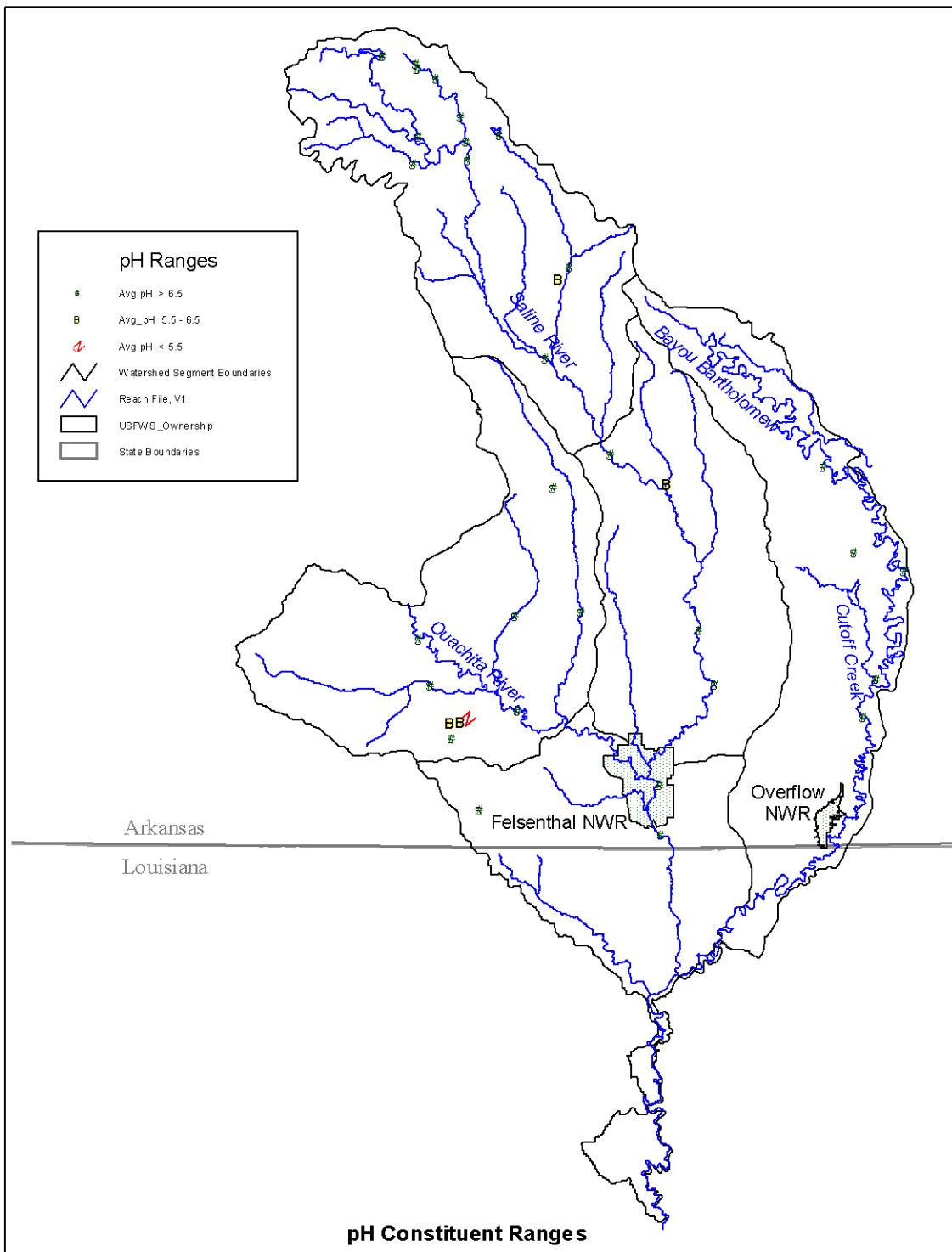


Figure 3.4. Average pH value ranges for Ouachita River basin.

## 4.0 DEVELOPMENT OF THE TMDL

### 4.1 Loading Capacity

The loading capacity of water bodies (i.e. the amount of mercury that can be introduced without adverse effects) differs on a site specific basis due to (1) inputs or load of mercury to the waterbody, (2) environmental conditions within the waterbody that mediate methylation and bioaccumulation, and (3) the food web or food chain through which mercury bioaccumulates (Armstrong et al. 1995).

### 4.2 Conceptual Framework

Mercury is unlike many other metals because it has a volatile phase at ambient temperatures and can be transported in a gaseous, soluble, or particulate form (Figure 4.1). Mercury is emitted to the atmosphere in both elemental gaseous Hg(0) and divalent Hg(II) forms. Anthropogenic direct emissions, natural emissions, and indirect re-emission of previously deposited mercury are major sources of mercury to the atmosphere (Figure 4.1). Gaseous Hg(0) is relatively insoluble and is capable of being transported long distances. However, ozone or other oxidizing agents in the atmosphere can convert Hg(0) to Hg(II). Hg(II) is much more soluble and can sorb onto particulates, resulting in both wet and dry mercury deposition within local (i.e., 100 km from the source, EPA 2001) and regional areas (EPRI 1994). Some Hg(II) can also be chemically reduced to Hg(0). Hg(0) can be transported long distances and contribute to regional and global background concentrations.

Local sources of atmospheric mercury are typically within about a 100 km radius of a site (EPA 2001). Regional sources of atmospheric mercury are loosely defined as other sources within a geographical area such as the Southeast, South, or Upper Midwest, while global sources include intercontinental contributions of mercury. Atmospheric mercury deposition can include contributions from all three sources.

In addition to atmospheric deposition, mercury can also enter waterbodies from point source effluent discharges and watershed nonpoint source contributions. These watershed nonpoint sources

include naturally occurring mercury in rocks and soils, and anthropogenic mercury in soils from current and historical atmospheric deposition (Figure 4.1).

The primary mercury species of concern for bioaccumulation and biomagnification through the food chain is the organic, or methylmercury, form (Figure 4.2). It is the transformation of inorganic mercury to methylmercury that results in its accumulation and biological magnification through the food chain (Figure 4.2). Methylmercury binds with protein in muscle tissue of fish and other living organisms. Because it is lost very slowly from fish tissue (Trudel and Rasmussen 1997), methylmercury concentrations continue to increase throughout the life of the fish as long as methylmercury is in the environment and in its prey species. Older, larger fish typically have higher mercury concentrations than younger, smaller fish.

Anaerobic environments in the sediments of wetlands, streams, rivers, and lakes or reservoirs; and in the anaerobic hypolimnions of lakes and reservoirs create environments that are particularly suitable for mercury methylation. Also, fish tissue mercury concentrations in new reservoirs (less than 15 to 20 years after impoundment) are typically higher than fish tissue mercury concentrations in older reservoirs. Wetlands also create environments that are very conducive to mercury methylation. Wetlands and new reservoirs contribute to elevated fish tissue mercury concentrations in the Ouachita River basin.

A number of studies have been done on sources of mercury exposure to fish in Arkansas (Armstrong et al. 1995, Lin and Scott 1997, Scott and McKimmey 1997, Shirley 1992). This work has led to the conclusion that the geology of the area contributes to mercury in Arkansas water bodies. Mercury concentrations in the Ouachita Mountains geologic formations ranged from 0.01 mg/kg to 3.0 mg/kg (Stone et al. 1995). Mercury was mined commercially in areas south of the Ouachita Mountains. The Ouachita River basin receives drainage from these areas of known high mercury geology (Figure 4.3). The mercury studies in Arkansas also found a high incidence of higher mercury concentrations in soils located over geologic formations with high mercury concentrations (Armstrong et al. 1995). Underlying parent geological material contributes to the formation of the overlying soils, particularly in these watersheds where soils are thin. The idea that mercury from geologic sources is contributing to high mercury levels in sediments and fish is well documented and accepted by the scientific community in Arkansas (Lin and Scott 1997). Therefore, geologic sources are included in the mercury loading estimate and TMDL.

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In summary, TMDLs for mercury must consider that mercury can exist as a gas as well as in solution or particulate forms. Mercury loads arise from atmospheric deposition contributed by both local and regional/global emission sources, point source effluent discharges, natural geological formations, and soils. However, after deposition or loading to the system, mercury can also be lost through volatilization and re-enter the atmospheric pool. It is the organic form as methylmercury that is biologically accumulated and magnified through the food chain. Once in fish, it is lost very slowly and continues to accumulate through time.

#### **4.3 TMDL Formulation**

A two step approach was used to estimate loading and the reductions required to achieve the designated fishable use in the Ouachita River basin waterbodies. Loading was estimated from both point and nonpoint sources in the first step (Section 4.4), while load reduction factors were calculated based on safe fish tissue Hg concentrations in the second step (Section 4.5). These two elements were then used to develop the TMDL (see equation below). This approach is similar to that used in previous fish tissue mercury TMDLs. In this TMDL annual loads are used rather than daily loads. Annual loads are more appropriate because the concern with this TMDL study is the long term accumulation of mercury, rather than short term acute toxicity events.

$$\text{TMDL} = (\text{EL}/\text{RF}) \times \text{SF}, \text{ where}$$

TMDL	=	total maximum daily load (use annual loads in this study, g/yr)
RF	=	Reduction Factor
EL	=	Existing total load (includes point, nonpoint and background sources)
SF	=	Site specific factor(s) (requires study, but could be based on measured sulfate, organic carbon, alkalinity or pH values that influence mercury methylation and bioaccumulation. Assumed to be 1 in this study).

## 4.4 Existing Load

The existing mercury load to the Ouachita River basin was estimated as the first step in developing the TMDL. Mercury sources to the Ouachita River and its tributaries included both nonpoint and point sources, corresponding to load and wasteload allocations, respectively. The equation below shows the sources of mercury included in the estimate of the existing load.

$$\text{Existing Load} = \text{RAD} + \text{LAD} + \text{SOIL} + \text{GEOL} + \text{NPDES} + \text{WWT}$$

Where:

RAD =	regional atmospheric deposition - deposition of mercury emissions from regional and global sources
LAD =	local atmospheric deposition - deposition of mercury emissions from local sources (within 100 km of the basin)
SOIL =	soil deposited mercury erosion - mercury in eroded soils that come from atmospheric deposition
GEOL =	soil geologic erosion - mercury in eroded soils that come from breakdown of rock with high mercury content
NPDES =	mercury in effluent of NPDES permitted discharger with a permit mercury limit
WWT =	mercury in effluent from permitted municipal waste water treatment plants

### 4.4.1 Nonpoint Sources

Nonpoint sources of the existing load included regional and local atmospheric deposition, soil deposited mercury erosion, and soil geologic erosion.

#### 4.4.1.1 Total Atmospheric Deposition

Data for regional atmospheric deposition were obtained from the National Atmospheric Deposition Program website. There are no mercury deposition monitoring stations in the state of Arkansas, therefore the two monitoring stations closest to the watershed were utilized (for a map showing locations of all the NADP mercury deposition monitoring sites, see <http://nadp.sws.uiuc.edu/mdn/sites.asp>). Data from monitoring locations LA10, in Franklin Parish, Louisiana, and TX21, in Gregg County, Texas, were used to represent atmospheric deposition of Hg in the watershed (Figure 4.4). Station LA10 is approximately 70 miles from Felsenthal NWR and

Station TX21 is approximately 175 miles from Felsenthal NWR. Station LA10 had data available for 1999 through 2002 and station TX21 had data available for 1996 through 2002 (NADP 2003). The data from these stations for 1999 through 2002 was used to estimate total atmospheric deposition and are summarized in Table 4.1. Total atmospheric deposition is the sum of wet and dry deposition. Wet deposition is the mercury removed from the atmosphere during rain events. Dry deposition is the mercury removed from the atmosphere on dust particles, sorption to vegetation, gaseous uptake by plants or other processes during non-rainfall periods (EPA 1997). The average value of the wet deposition reported at the two stations was  $13.2 \mu\text{g}/\text{m}^2/\text{yr}$ . Dry deposition was assumed to be 50% of wet deposition (EPA 2001). Therefore total deposition equal wet deposition times 1.5, or  $19.8 \mu\text{g}/\text{m}^2/\text{yr}$ .

Precipitation data were also available from the NADP website (NADP 2003) and are summarized in Table 4.1. These data were compared with precipitation data for the Ouachita River watershed during the same period, which were obtained from Hydrosphere (2000) and are summarized in Table 4.1 (see Appendix C: Ouachita River Precipitation Estimate). During the period from 1999 through 2002 average annual precipitation at the NADP stations and the study area were very similar (1.31 vs 1.36 m/yr (Table 4.1). Therefore, the mercury deposition rates measured at the NADP stations are assumed to be representative of conditions in the Ouachita River basin.

The estimated atmospheric mercury deposition rate of  $19.8 \mu\text{g}/\text{m}^2/\text{yr}$  was used to determine the mercury loading to streams, lakes, reservoirs, and wetlands from atmospheric deposition. Table 4.2 shows the area of each of the five HUCs that are included in this TMDL and Subsegment 080101 covered by streams, lakes, reservoirs, and wetlands (BASINS Version 2.0 1999). The sum of the stream, lake, reservoir, and wetland areas was multiplied by  $19.8 \mu\text{g}/\text{m}^2/\text{yr}$  to obtain an atmospheric mercury load of 55,090 g/yr.

#### **4.4.1.2 Local Atmospheric Deposition**

Total atmospheric deposition can be partitioned into local and regional sources. The Louisiana and Texas mercury deposition monitoring stations are assumed to include both local emission sources similar to those in Arkansas and regional and global inputs. Local atmospheric deposition for the watershed was estimated based on data from the EPA Emission Factor and Inventory Groups 1999 National Emissions Inventory (NEI) database. The NEI is a complete national inventory of stationary and mobile sources that emit hazardous air pollutants (HAPs). Point and nonpoint hazardous air pollutant emission access data files were downloaded from the 1999 national emission inventory web site (<http://www.epa.gov/ttn/chief/net/1999inventory.html>). These files contain annual total loads for all known sources of the 188 EPA listed hazardous air pollutants for each state.

In this TMDL study, local sources are defined as sources within the watershed and within all counties within a distance of 100 km around the watershed boundary. The area within which these local sources are located is referred to as the “airshed”. The NEI data files list the counties in which sources are located, therefore the airshed boundary is determined by county boundaries and if a portion of a county falls within 100 km of the watershed boundary, then the entire county is included as part of the airshed. The airshed boundary for the watershed is shown on Figure 4.5. The airshed contains 160,672 km<sup>2</sup>. The mercury emissions for each MACT category found within the airshed and the Hg(II) emissions calculated from the MACT data that contribute to the local atmospheric deposition are shown in Table 4.3. MACT categories not included in Table 4.3 (e.g., medical waste incineration) were not present in the airshed, but could contribute to the global/regional atmospheric mercury load.

The calculation of the local source deposition ratio was based on a simplification of the method used in Savannah River Mercury TMDL (EPA 2001) and was performed as follows. Divalent mercury (Hg(II)) is the dominant form of mercury in both rainfall and most dry deposition. An estimate of the Hg(II) emitted from MACT category sources in the airshed was calculated based on source speciation percentages (Table 4.3). The total estimated Hg (II) deposition from all sources within the watershed was 227,427 g/yr (Table 4.3). Since the watershed is only a fraction of the airshed the emitted mercury may or may not fall within the watershed boundary. Therefore, the mercury deposition rate to the watershed due to local sources was determined by dividing the Hg(II)

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emissions of the airshed (227,427 g/yr) by the airshed area (160,672 km<sup>2</sup>). This calculation provided a local source deposition estimate of 1.4 µg/m<sup>2</sup>/yr.

#### **4.4.1.3 Regional Atmospheric Deposition**

The regional deposition rate was set equal to the total deposition rate (19.8 µg/m<sup>2</sup>/yr) minus the local source deposition rate (1.4 µg/m<sup>2</sup>/yr). Based on the analysis of the local sources, approximately 7% (3,929 g/yr) of the mercury deposition can be attributed to local sources and 93% (51,161 g/yr) can be attributed to global and regional sources.

#### **4.4.1.4 Soil Deposited Mercury and Geologic Erosion**

Sediment load for the watershed was based on erosion rates of agricultural, barren, and forest land use areas. The land use areas were based on information from Basins 2.0. Erosion rates were estimated based on information from USDA Natural Resource Conservation Service (Bloodworth and Berc 1998), Handbook of Nonpoint Pollution (Novotny and Chesters 1981), and Ozark-Ouachita Highlands Assessment Report (USDA FS 1999). Cropland erosion rates average 3.4 tons/year. Cropland with highly erodible soils have rates of 6.2 to 6.4 tons/year and cropland with soils that are not highly erodible have rates of 2.3 to 2.4 tons/year. Forest land erosion rates ranged from 0.2 to 0.8 tons/year. There was a small percentage of urban and barren land within the watershed. The areas associated with urban and barren land uses were included in the calculations with cropland erosion rates applied. Table 4.4 shows the total area, agricultural land area, forest land area, and barren land area for each of the 5 HUCs and subsegment 080101. Percentages of the basin area in each land use are also included. Table 4.5 shows the sediment loads (tons of sediment per year) calculated by multiplying the erosion rates by the land use areas within each HUC and subsegment 080101 (Table 4.4).

Indirect atmospheric mercury contributions in overland flow during rain events were not estimated. The majority of the watershed is forested (Table 4.4), and overland flow during rain events in forested lands is minimal (Waring and Schlesinger 1985). Therefore, it was assumed that indirect atmospheric contributions via overland flow during rain events would not be significant.

Given that geologic weathering contributes to soils, a portion of the mercury in soil would come from mercury sources in the underlying geology. In this TMDL study the portion of soil

mercury contributed by geologic sources (soil/geologic erosion) was estimated and categorized as background load. In addition, on-going and historical atmospheric mercury deposition over the past several decades, if not centuries, has also contributed mercury to the soils. While some of this mercury was likely re-emitted to the atmosphere, some of this previously deposited mercury would sorb to the soils and be transported to receiving waters. This portion of the load was the nonpoint source load (soil/deposited mercury erosion).

A number of measurements of mercury in rock formations in the Ouachita Mountains (Stone et al. 1995) and sediments in the Ouachita River basin (Armstrong et al. 1995) were available (Figure 4.6). Mercury concentrations measured in both rock and sediments in Arkansas exhibited a large degree of variability (Figure 4.7). To get an idea of the range of possible soil/geologic erosion (background) and soil/deposited mercury erosion loads, three loads were calculated. The upper boundary load was calculated using 90th percentile rock and sediment mercury concentrations measured in Arkansas (Table 4.6). The lower boundary load was calculated using 10th percentile rock and sediment mercury concentrations from the same data set. The load considered to be most realistic (likely) was calculated using the geometric means of shale (0.09 mg/kg) and sediment (0.16 mg/kg) mercury concentrations. Shale mercury was used for the most likely load calculation because it is very common in the Ouachita Mountains and is the most easily erodible rock analyzed (Armstrong et al. 1995).

Estimates of the soil/geologic erosion (background) mercury load were calculated by multiplying the rock mercury concentration by the total sediment loading for each HUC (Table 4.5) to obtain the mercury in g/yr (Table 4.7). The soil/deposited mercury erosion load was estimated by multiplying the non-geologic soil mercury concentration by the tons of sediment per year. The non-geologic soil mercury concentration was calculated as the sediment mercury concentration minus the rock mercury concentration (Table 4.6). Therefore, the upper boundary non-geologic soil mercury concentration was 0.05 mg/kg, the lower boundary concentration was 0.01 mg/kg, and the most likely concentration was 0.07 mg/kg. The loads calculated using these rock and sediment concentrations are shown in Table 4.7.

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#### **4.4.2 Point Sources**

There is only one NPDES permitted source in the basin with mercury limits in its permit. The point source discharge receiving stream is Boggy Creek. Boggy Creek drains to Bayou de Loutre. There is no fish consumption advisory for Boggy Creek or Bayou de Loutre. To estimate the wasteload allocation, the NPDES point source discharge is assumed to be discharging at its permit mercury limit 24 hours/day, 7 days/week. This assumption is considered conservative because it is unlikely that this occurs. In addition, it is assumed there was no mixing zone and an end-of-pipe wasteload allocation was used. This is consistent with the Great Lakes Initiative for managing bioaccumulative pollutants. Dilution is not assumed because of the persistence and non-conservative nature of mercury.

Municipal wastewater treatment facilities were also assumed to discharge some mercury because mercury at low levels has been measured in these facilities in Arkansas and other U.S. regions. ADEQ conducted a monitoring study of five municipal wastewater treatment plants in Arkansas using clean sampling procedures and ultra-trace level analyses and found an average concentration of about  $0.015 \mu\text{g/L}$  of mercury in municipal discharges (Allen Price, ADEQ, personal communication 2001). This mercury concentration was assumed for all the municipal facilities within the basin and mercury wasteloads estimated for these sources.

##### **4.4.2.1 NPDES Point Source**

Table 4.8 shows the results of calculations for NPDES sources. ENSCO, Inc., AR, was the only NPDES permitted source found with a mercury limit in their permit. Their permit limit is  $0.2 \mu\text{g/L}$  and their discharge was listed as 1.29 MGD. Multiplying these values together, and converting units, resulted in a conservative mercury loading estimate of 356 g/yr.

##### **4.4.2.2 Municipal Wastewater Treatment Plants**

An estimate of the contribution of mercury to the watershed from municipal wastewater treatment (WWT) plants was also calculated (Table 4.9). The list of city municipal WWT plants was obtained from the PCS search done for NPDES permitted facilities (see Appendix A). An assumption was made for the mercury concentration in the wastewater discharge. The concentration used was  $0.015 \mu\text{g/L}$ , which was multiplied by the discharge from the city WWT plants obtained

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from the PCS search. The resulting estimated mercury loading from municipal wastewater discharges was 675 g/yr.

#### **4.4.3 Summary of Existing Load**

The total mercury load to the portion of the Ouachita River and its tributaries included in this study, on both an annual and a daily basis, is shown in Table 4.10. The municipal and NPDES permitted point source contributions are very small (<1%) compared to the atmospheric and watershed nonpoint source contributions. The upper boundary and most likely soil/deposited mercury erosion and soil/geologic erosion mercury loads account for the majority of the mercury load to the Ouachita River basin. With the lower boundary soil/deposited mercury erosion and soil/geologic erosion mercury loads, regional atomospheric deposition accounts for the majority of the mercury load to the Ouachita River basin. Therefore, soils, geology, and regional air deposition are the primary contributors to the mercury load in the Ouachita River basin.

### **4.5 Reduction Factors**

In the second step of the TMDL development process reduction factors were estimated using the maximum and the average of measured largemouth bass tissue concentrations in the three impaired lakes and back calculating the decrease needed in fish tissue concentration to achieve the target fish tissue mercury concentration.

If the mercury body burden of the primary fish species of concern were reduced to less than 1.0 mg/kg the water bodies would no longer be subject to fish consumption advisories due to mercury and achieve their designated, fishable uses. Therefore, the mercury reductions used to develop the TMDLs were based on the required reduction in fish tissue mercury concentrations needed to achieve the fish tissue mercury target level 0.8 mg/kg. This target level tissue mercury concentration provides a 20% margin of safety for the Arkansas fish consumption Action Level. A linear relationship was assumed between mercury source reduction and reductions in fish tissue mercury concentrations. This relationship is consistent with steady-state assumptions and the use of bioaccumulation factors. However, interactions of both inorganic and organic mercury with sulfide, organic carbon, and other water quality constituents can affect its bioavailability for both methylation and uptake (Armstrong et al. 1995; EPA 1997, 1998).

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In order to establish the reductions needed in edible fish tissue, the worst case and average body burden were divided by the target tissue mercury concentrations. The worse case body burden was the highest mercury concentration of composite filet samples of largemouth bass sampled from the impaired lakes (Table 4.11). The average body burden was the average of mercury concentrations measured in largemouth bass in a waterbody (Table 4.12). This approach follows and builds on the precedence established in *Mercury TMDLs for Segments Within Mermentau and Vermillion-Teche River Basins* (EPA 2000).

## **4.6 TMDL**

The target mercury loads calculated using the reduction factors are shown in Table 4.13. These target mercury loads represent 23% to 55% reductions of the estimated current basin mercury loads.

Table 4.14 provides a mercury mass balance with reductions in mercury loads from the various sources based on implementation of mercury emission controls and erosion best management practices (BMPs) in the watershed. The assumptions used to devleop the reduced mercury loads in Table 4.14 are described in the following sections. In comparing these reduced total basin mercury loads to the target mercury loads (Table 4.13) it appears that existing emission controls and BMPs can be expected to reduce average, and possibly even maximum, largemouth bass tissue mercury concentrations to below the Arkansas fish consumption advisory level.

### **4.6.1 Wasteload Allocation**

The analysis of NPDES point sources in the watershed indicates that the cumulative loading of mercury from these facilities is less than 1% of the total estimated current loading (Table 4.12). Even if this TMDL were to allocate none of the calculated allowable load to NPDES point sources (i.e., a wasteload allocation of zero), the applicable water quality standards for mercury would not be attained in the waterbody because of the very high mercury loadings from nonpoint and background sources. At the same time, however, EPA recognizes that mercury is an environmentally persistent bioaccumulative toxic with detrimental effects to human fetuses even at minute quantities, and as such, should be eliminated from discharges to the extent practicable. Taking these two considerations into account, this TMDL, therefore, provides that mercury contributions from the city

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municipal WWT plants not exceed the mercury water quality standard for Arkansas ( $0.012 \mu\text{g/L}$ ). No change in mercury limits is provided for the NPDES point source with permit limits for mercury (Table 4.14).

#### **4.6.2 Load Allocation**

Existing MACT regulations of mercury emissions will account for some of the needed reductions in mercury deposition in the Ouachita River basin. Final rules for mercury emissions are in effect for three of the MACT categories identified as local mercury sources to the Ouachita River basin. Table 4.15 lists these MACT categories and the expected reductions in their mercury emissions as a result of the implementation of the final rules. Overall, local sources of mercury deposition would be expected to be reduced by 22%. Existing regulations reducing mercury emissions from power generation, municipal waste combustion, medical waste incineration, and hazardous waste combustion are expected to reduce national mercury emissions by about 50% (see Section 6.0). Therefore, regional sources of atmospheric mercury deposition could also be expected to be reduced by about 50%.

Tables 4.14 and 4.16 show reductions in the atmospheric mercury load as a result of implementation of MACT regulations. Table 4.16 shows a mercury mass balance with only atmospheric mercury loads reduced. In these tables the local atmospheric deposition load has been set to 78% of the current local atmospheric deposition load (shown in Table 4.12) to reflect the expected 22% reduction. The regional atmospheric deposition load has been set to 50% of the current regional atmospheric deposition load (shown in Table 4.12) to reflect the expected 50% reduction.

The reduced loads for the soil/deposited mercury also take into account reductions in atmospheric deposition sources. Reducing atmospheric deposition should result in less mercury in soils from atmospheric deposition. The sum of the reduced atmospheric deposition load to the basin (local and regional) is about 48% less than the current atmospheric deposition load to the basin (Table 4.12). Therefore, the soil/deposited mercury loads shown in Tables 4.14 and 4.16 were reduced by 48%.

The total basin loads for the Most Likely and Lower Boundary scenarios shown in Table 4.16 are less than the target loads based on average fish tissue mercury concentrations in the

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water bodies being less than the Arkansas fish consumption advisory Action Level (Table 4.13). Therefore, mercury emission regulations could reduce fish consumption advisories in the listed water bodies and the Ouachita River basin. Mercury emission limits for additional source categories are either proposed or planned (EPA 2002). Therefore, further reductions would be expected in both local and regional atmospheric mercury loads to the basin in the future. It is uncertain what the magnitude of these reductions would be.

Additional reductions in the basin mercury load may be possible with the application of best management practices (BMPs) to reduce erosion. Reducing erosion would reduce both the soil/deposited mercury erosion and the soil/geologic erosion mercury loads. Table 4.17 shows the reduction in sediment loads to the Ouachita River basin that would occur if the erosion rates for agricultural and barren land uses were the same as the erosion rate for forest land (0.2 tons/acre/yr). This erosion rate is equivalent to approximately a 90% reduction in erosion from the agricultural and barren lands. Although it is not likely that implementing BMPs would actually reduce erosion rates on agricultural or barren lands this much, the erosion rate of 0.2 tons/acre/yr was used to show the best possible conditions for the basin. The soil/deposited mercury erosion load shown in Table 4.14 also incorporates the reduction in mercury from atmospheric deposition (i.e. the load calculated from the lower erosion rate was reduced by 48%).

The nonpoint and background loads shown in Table 4.14 are based on the lowest possible erosion rates. Comparing the basin loads in Table 4.14 to the target loads in Table 4.13 indicates that it should be very possible to reduce average, and even maximum largemouth bass tissue mercury concentrations to below the Arkansas mercury consumption advisory Action Level.

#### **4.6.3 Unallocated Reserve**

The conservative estimates used throughout these analyses, including the conservative reduction factors should provide an unallocated reserve for mercury loading to the Ouachita River and its tributaries.

Table 4.1. Deposition estimates for the Ouachita River basin.

NADP Data Summary			Precipitation Data (1999 - 2002)		NADP Data Summary		
Station	Year	Rain Gauge (m/yr)	HUC	Avg. Precip. (m/yr)	Station	Year	Wet Total Hg Deposition ( $\mu\text{g}/\text{m}^2/\text{yr}$ )
TX21	1999	0.93	8040201	1.45	TX21	1999	10.3
TX21	2000	1.18	8040202	1.48	TX21	2000	14.4
TX21	2001	1.68	8040203	1.25	TX21	2001	15.3
TX21	2002	0.99	8040204	1.37	TX21	2002	8.4
LA10	1999	1.32	8040205	1.09	LA10	1999	13.3
LA10	2000	1.08	8040207	1.48	LA10	2000	11.7
LA10	2001	1.75			LA10	2001	18.6
LA10	2002	1.52			LA10	2002	14.0
Average		1.31	Average	1.36	Average		13.2
Dry + Wet = Average wet x 1.5 = $19.8 \mu\text{g}/\text{m}^2/\text{yr}$							

Table 4.2. Mercury deposition load to streams, lakes, reservoirs, and wetlands in the Ouachita River basin.

Subbasin	Atmospheric Deposition to Lakes, Reservoirs, Wetlands				
	Streams (acres)	Lakes Reservoirs (acres)	Wetlands (acres)	Lakes Reservoirs & Wetlands (km <sup>2</sup> )	Hg Deposition to waterbodies (g/yr)
8040201	—*	1,597	265,811	1,082.16	21,478
8040202	3,383	5,269	180,740	766.44	15,211
8040203	—	4,172	11,502	63.43	1,259
8040204	—	2,033	152,706	626.21	12,428
8040205	1,460	2,386	46,139	20228	4,015
Subsegment 08010	4,463	434	3,802	35.20	699
Total	9,306	15,891	660,700	2,775.72	55,090
Regional	(18.4 $\mu\text{g}/\text{m}^2/\text{yr}$ )				
Local	(1.42 $\mu\text{g}/\text{m}^2/\text{yr}$ )				

\*No estimate of areas in streams and canals available in the BASINS land use data for these subbasins.

Table 4.3. Local source mercury emissions within the airshed based on 1999 NEI report data.

MACT Category	Number of Sources	Total Emissions (kg/yr)	Hg(II) Speciation Percentage	Hg(II) (g/yr)
0105 - Industrial Combustion Coord Rule: Stationary Internal Combustion Engines	13	0.02	10%	2
0107 - Industrial/Commercial/Institutional Boilers and Process	670	81.9	30%	24,570
0502 - Petroleum Refineries - Catalytic Cracking, Catalytic Reforming, & Sulfur Plant Units	2	3.4	30%	1,031
0801 - Hazardous Waste Incineration	7	263.9	20%	52,791
0802 - Municipal Landfills	73	0.28	0%	-
1626 - Pulp & Paper Production	64	154.6	30%	46,374
1640 - Miscellaneous Organic Chemical Processes	43	0.01	30%	2
1807 - Industrial Combustion Coord Rule: Industrial, Commercial & Other Waste Incineration	90	0.61	20%	121
1808 - Utility Boilers	9	254.8	30%	76,439
Emissions reported without a MACT code	352	87.0	30%	26,098
Total	1,323	846.6		227,427

Table 4.4. Erosion sources for the Ouachita River basin, by subbasin.

Subbasin	Subbasin Area (acre)	Agricultural Land		Forest Land		Barren Land		Total Percent of Basin
		(acre)	(% of Basin Area)	(acre)	(% of Basin Area)	(acre)	(% of Basin Area)	
8040201	1,162,920	68,607	5.9	802,703	69	9,405	0.8	76
8040202	825,028	54,119	6.6	570,188	69	1,014	0.1	76
8040203	1,097,220	90,928	8.3	955,312	87	20,572	1.9	97
8040204	967,583	118,368	12.0	688,661	71	334	0.0	83
8040205	1,080,000	403,618	37.4	603,832	56	1,216	0.1	93
080101	97,482	11,523	11.8	66,457	68	-	0.0	80
<b>Total Watershed</b>	<b>5,230,233</b>	<b>747,163</b>	<b>14.3</b>	<b>3,687,153</b>	<b>70</b>	<b>32,541</b>	<b>0.6</b>	<b>85</b>

Table 4.5. Sediment load estimated for Ouachita River basin, by subbasin.

Subbasin	Agricultural Land		Forest Land		Barren Land		Total Sediment (tons/year)
	Erosion Rate (tons/acre/year)	Sediment (tons/year)	Erosion Rate (tons/acre/year)	Sediment (tons/year)	Erosion Rate (tons/acre/year)	Sediment (tons/year)	
8040201	2.4	164,657	0.2	160,541	2.4	22,572	347,769
8040202	2.4	129,886	0.2	114,038	2.4	2,434	246,357
8040203	2.4	218,227	0.2	191,062	2.4	49,373	458,662
8040204	2.4	284,083	0.2	137,732	2.4	802	422,617
8040205	2.4	968,683	0.2	120,766	2.4	2,918	1,092,368
080101	2.4	27,656	0.2	13,291	2.4	—	40.947
Total Watershed		1,793,192		737,431		78,098	2,608,721

Table 4.6. Mercury concentrations (mg/kg) used to estimate erosion mercury loads.

	Upper Boundary	Most Likely	Lower Boundary
Sediment Mercury	0.30	0.16	0.02
Rock Mercury	0.25	0.09	0.01
Non-geologic Soil Mercury (Sediment-Rock)	0.05	0.07	0.01

Table 4.7. Load estimated from erosion sources in Ouachita River basin, by subbasin.

Subbasin	Total Sediment (tons/yr)	Upper Boundary		Most Likely		Lower Boundary	
		GeologicErosion (g/yr)	Deposited Mercury (g/yr)	GeologicErosion (g/yr)	Deposited Mercury (g/yr)	GeologicErosion (g/yr)	Deposited Mercury (g/yr)
8040201	347,769	78,874	15,775	28,395	22,085	3,155	3,155
8040202	246,357	55,874	11,175	20,115	15,645	2,235	2,235
8040203	458,662	104,025	20,805	37,449	29,127	4,161	4,161
8040204	422,617	95,850	19,170	34,506	26,838	3,834	3,834
8040205	1,092,368	247,749	49,550	89,190	69,370	9,910	9,910
080101	40,947	9,287	1,857	3,343	2,600	371	371
Total Watershed	2,608,721	591,658	118,332	212,997	165,664	23,666	23,666

Table 4.8. Mercury load estimated from NPDES permitted source, assuming permit limit equals the mercury concentration in the effluent.

HUC	Discharge (MGD)	Permit Limit Hg ( $\mu\text{g/L}$ )	Mercury (ng/day)	Mercury (g/yr)
ENSCO	1.29	0.2	9.77E+08	356

Table 4.9. Mercury load estimated from municipal wastewater treatment plants assuming an average concentration of  $0.015 \mu\text{g/L}$ .

HUC	City Discharge (MGD)	Estimated Hg ( $\mu\text{g/L}$ )	Mercury ( $\mu\text{g/day}$ )	Mercury (g/yr)
8040201	7.75	0.015	4.40E+08	161
8040202	7.44	0.015	4.22E+08	154
8040203	9.49	0.015	5.39E+08	197
8040204	3.62	0.015	2.05E+08	75
8040205	4.2	0.015	2.41E+08	88
Total	32.5		1.85E+09	675

Table 4.10.Existing mercury load calculated for Ouachita River basin.

Source Type	Upper Boundary			Most Likely			Lower Boundary		
	Loading Rate		Percent of Total Load	Loading Rate		Percent of Total Load	Loading Rate		Percent of Total Load
	(g/yr)	(g/d)		(g/yr)	(g/d)		(g/yr)	(g/d)	
<b>Point Source</b>									
NPDES Point Source	356	1	0.0%	356	1	0.1%	356	1	0.3%
Municipal WWTP	675	2	0.1%	675	2	0.2%	675	2	0.7%
<b>Non Point Source</b>									
Regional Atmospheric Deposition	51,161	140	6.7%	51,161	140	11.8%	51,161	140	49.5%
Local Atmospheric Deposition	3,929	11	0.5%	3,929	11	0.9%	3,929	11	3.8%
Soil/Deposited Hg Erosion	118,332	324	15.4%	165,664	454	38.1%	23,666	65	22.9%
<b>Background</b>									
Soil/Geologic Erosion	591,658	1,621	77.2%	212,997	584	49.0%	23,666	65	22.9%
<b>Total</b>	766,110	2,099	100%	434,782	1,191	100%	103,453	283	100%

Source load allocation based on:

- a) 18.4 F<sub>g</sub>/m<sup>2</sup>/yr Regional atmospheric deposition to lakes, reservoirs, & wetlands
- b) 1.42 F<sub>g</sub>/m<sup>2</sup>/yr Local atmospheric deposition to lakes, reservoirs, & wetlands
- c) 0.25, 0.09, and 0.01 mg/kg Hg concentration in soil from geologic sources
- d) 0.05, 0.07, and 0.01 mg/kg Hg concentration in soil due to atmospheric deposition
- e) 2.4 tons/acre erosion rate for agricultural and barren lands
- f) 0.2 tons/acre erosion rate for forested lands
- g) Permit limit for NPDES point source of 0.2 F<sub>g</sub>/L Hg and 1.29 MGD discharge rate
- h) City municipal discharges at 0.015 F<sub>g</sub>/1 Hg and 32.4 MGD discharge rate

Table 4.11. Reduction factor needed to reduce maximum body burden to target level.

<b>Location</b>	<b>Maximum Largemouth Bass Hg Concentration (mg/kg)</b>	<b>Reduction Factor to Achieve Target Level*</b>
Big Johnson Lake	1.71	2.1
Grays Lake	1.78	2.2
Lake Monticello	1.93	2.4
Average		2.2

\* Target Level = 0.8 mg/kg

Table 4.12. Reduction factor needed to reduce average body burden to target level.

<b>Location</b>	<b>Average Largemouth Bass Hg Concentration (mg/kg)</b>	<b>Reduction Factor to Achieve Target Level*</b>
Big Johnson Lake	0.91	1.1
Grays Lake	1.18	1.5
Lake Monticello	0.96	1.2
Average		1.3

\* Target Level = 0.8 mg/kg

Table 4.13. Comparison of target mercury loads and existing mercury loads for the Ouachita River basin.

	<b>Upper Boundary Loading Rate (g/yr)</b>	<b>Most Likely Loading Rate (g/yr)</b>	<b>Lower Boundary Loading Rate (g/yr)</b>	<b>Percent Reduction</b>
Existing Ouachita River Basin Hg Load	766,110	434,782	103,453	
Target Load based on Arkansas Maximum Reduction Factor (2.2)	348,232	197,628	47,024	55%
Target Load based on Arkansas Average Reduction Factor (1.3)	589,315	334,447	79,479	23%

Table 4.14. Ouachita River basin mercury mass balance with mercury loads reduced due to mercury emission controls and erosion best management practices.

Source Type	Upper Boundary		Most Likely		Lower Boundary	
	Loading Rate (g/yr)	Percent of Total Basin Load	Loading Rate (g/yr)	Percent of Total Basin Load	Loading Rate (g/yr)	Percent of Total Basin Load
<b>Point Source (WLA)</b>						
NPDES Point Source	356	0.1%	356	0.3%	356	0.9%
City Municipal WWT	540	0.2%	540	0.4%	540	1.3%
<b>Non Point Source (LA)</b>						
Regional Atmospheric Deposition	25,580	10.1%	25,580	19.4%	25,580	61.1%
Local Atmospheric Deposition	3,065	1.2%	3,065	2.3%	3,065	7.3%
Soil/Deposited Hg Erosion	21,071	8.3%	29,499	22.4%	4,214	10.1%
<b>Background</b>						
Soil/Geologic Erosion	202,617	80.0%	72,942	55.3%	8,105	19.4%
<b>Total</b>	<b>253,229</b>	<b>100.0%</b>	<b>131,982</b>	<b>100.0%</b>	<b>41,860</b>	<b>100.0%</b>

Source load allocation based on:

- a) 9.2 Fg/m<sup>2</sup>/yr Regional atmospheric deposition to lakes, reservoirs, and wetlands
- b) 0.71 Fg/m<sup>2</sup>/yr Local atmospheric deposition to lakes, reservoirs, and wetlands
- c) 0.25, 0.09, and 0.01 mg/kg Hg concentration in soil from geologic sources
- d) 0.05, 0.07, and 0.01 mg/kg Hg concentration in soil due to atmospheric deposition
- e) 0.2 tons/acre erosion rate for agricultural, barren, and forest lands
- f) Permit limit for NPDES point source of 0.2 Fg/L Hg and 1.29 MGD discharge rate
- g) City municipal discharges at 0.012 Fg/L and 32.4 MGD discharge rate

Table 4.15. Reductions in local atmospheric mercury sources based on existing MACT regulations.

MACT Category	Percent Reduction	Source	Current Hg(II) Load (g/yr)	Expected Hg(II) Load (g/yr)
0801 - Hazardous Waste Incineration	55%	EPA Hazardous Waste Combustion FAQs website	18,220	8,199
1626 - Pulp & Paper Products	59%	Table VII-2 Federal Register April 15, 1998 Vol. 63, No. 72	62,882	25,781
1807 - Industrial Combustion Coord Rule: Industrial, Commercial, and Other Waste Incineration	34%	Table 4 Federal Register December 1, 2000 Vol. 65	1,697	1,120
Airshed total local source mercury load			212,921	165,223

Table 4.16. Mercury mass balance with atmospheric sources reduced based on MACT regulations.

Source Type	Upper Boundary		Most Likely		Lower Boundary	
	Loading Rate (g/yr)	Percent of Total Load	Loading Rate (g/yr)	Percent of Total Load	Loading Rate (g/yr)	Percent of Total Load
<b>Point Source</b>						
NPDES Point Source	356	0.1%	356	0.1%	356	0.5%
City Municipal WWT	540	0.1%	540	0.2%	540	0.8%
<b>Non-Point Source</b>						
Regional Atmospheric Deposition	25,580	3.7%	25,580	7.8%	25,580	39.0%
Local Atmospheric Deposition	3,065	0.4%	3,065	0.9%	3,065	4.7%
Soil/Deposited Hg Erosion	61,532	9.0%	86,145	26.2%	12,306	18.8%
<b>Background</b>						
Soil/Geologic Erosion	591,658	86.7%	212,997	64.8%	23,666	36.1%
Total	682,731	100.0%	328,683	100.0%	65,513	100.0%

Table 4.17. Sediment load estimated for Ouachita River basin, by subbasin, with erosion rates for agricultural and barren land set to 0.2 tons/acre/year.

HUC	Agricultural Land Sediment (tons/year)	Forest Land Sediment (tons/year)	Barren Land Sediment (tons/year)	Total Sediment (tons/year)
8040201	13,721	160,541	1,881	176,143
8040202	10,824	114,038	203	125,064
8040203	18,186	191,062	4,114	213,362
8040204	23,674	137,732	67	161,473
8040205	80,724	120,766	243	201,733
Subsegment 080101	2,305	13,291	-	15,596
Total Watershed	149,453	737,431	6,508	893,371

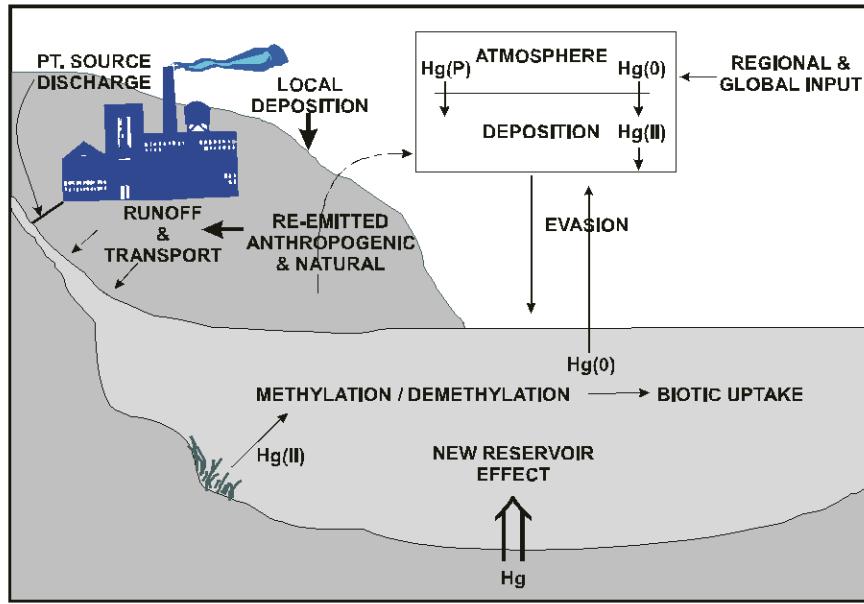


Figure 4.1. General mercury cycle showing atmospheric transport and deposition, point, nonpoint source and natural background contributions, and the effects of new reservoirs on mercury release into the environment (after Mason et al. 1994).

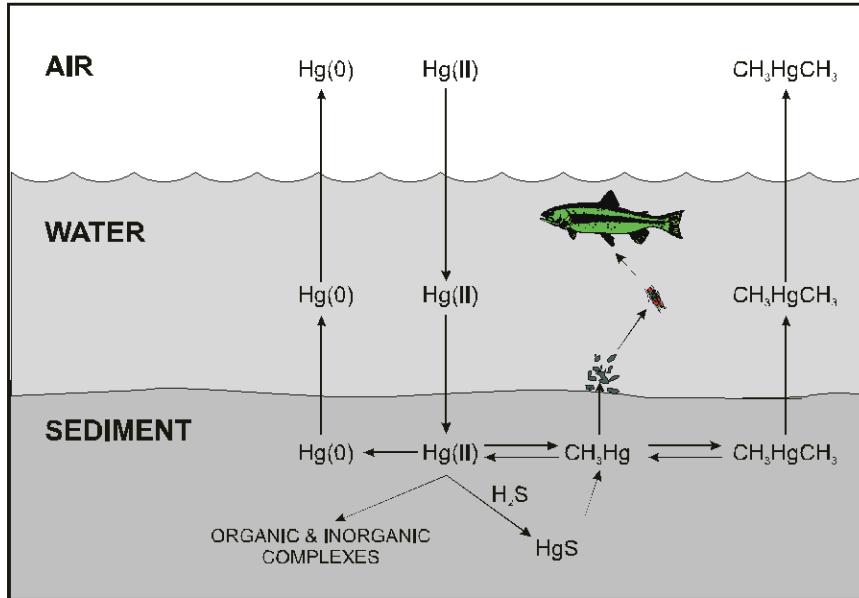
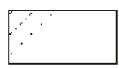
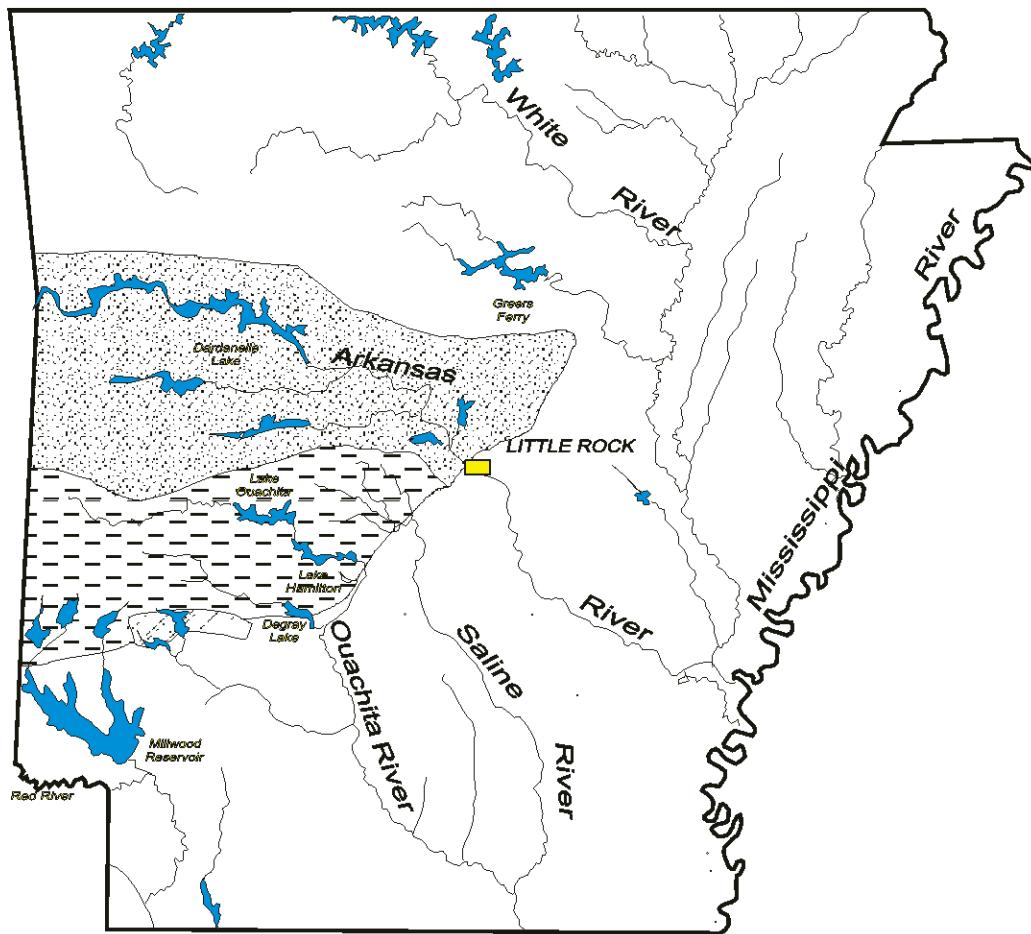


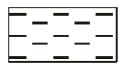
Figure 4.2. Pathways for mercury species through the aquatic ecosystem, including methylation and demethylation, evasion or loss from the water to the atmosphere, and sedimentation and burial in the sediment (after Winfrey and Rudd 1990).



**Mercury District**



**Arkansas River Valley Shales**



**Ouachita Mountain Shales**

Figure 4.3. Shale formations and mercury district in Arkansas and relation to the Ouachita River basin from Armstrong et al. (1995).



Figure 4.4. Location of NADP monitoring stations LA10 Franklin Parish, LA and TX21 Gregg County, TX.

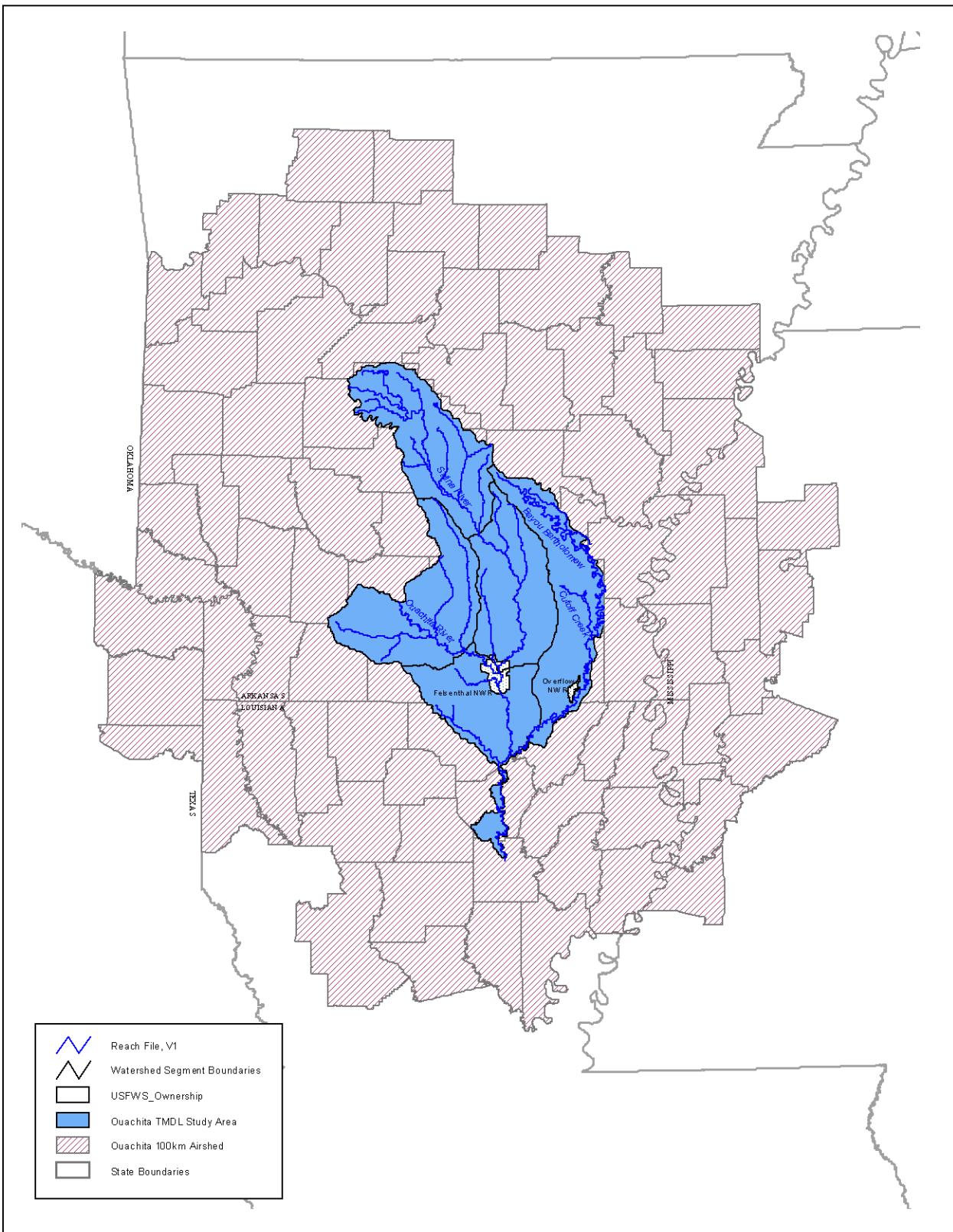


Figure 4.5. Airshed boundary for the Ouachita River basin watershed.

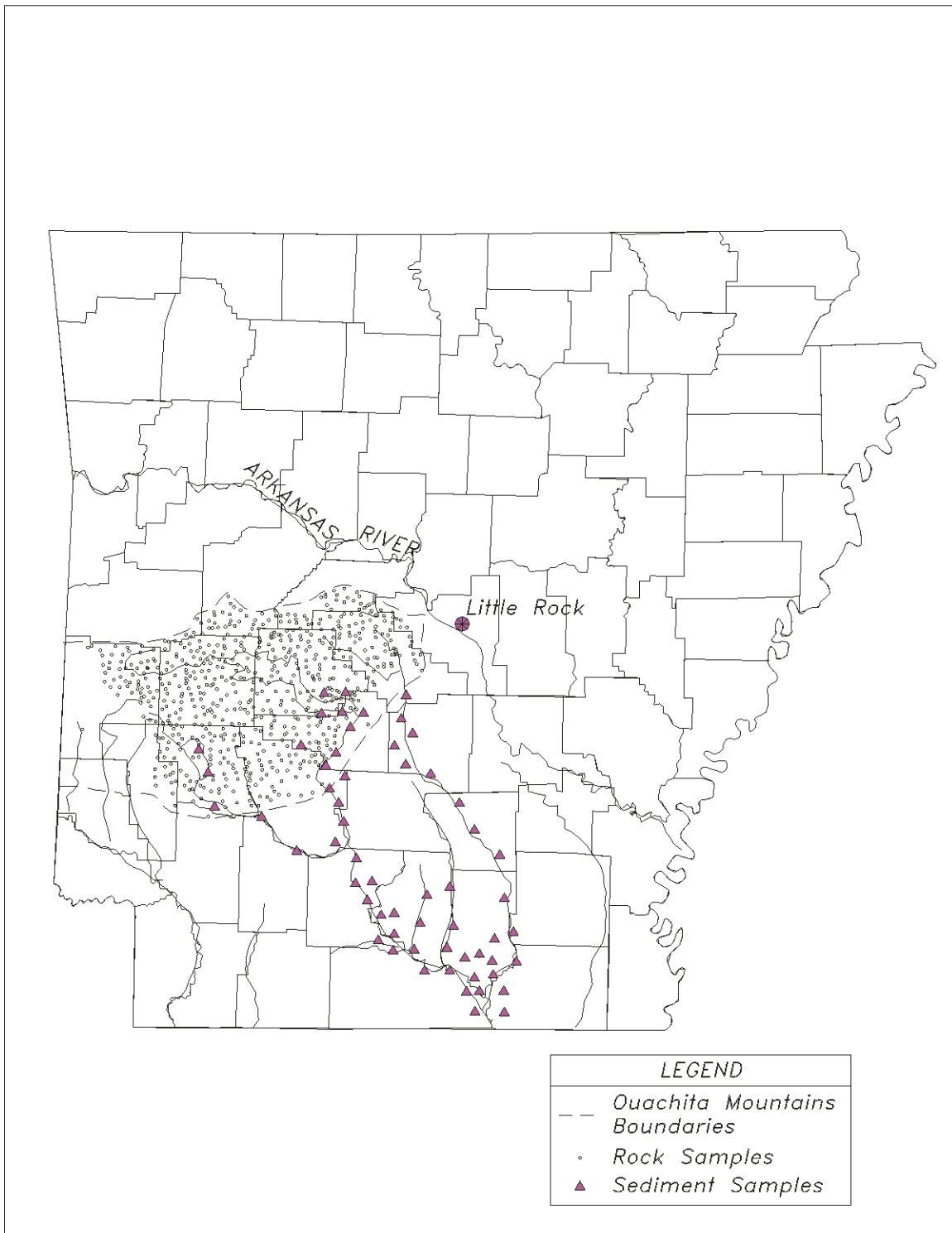


Figure 4.6. Sediment (triangle) and rock (dot) sampling locations for mercury analysis (Stone et al. 1995, Armstrong et al. 1995).

## **Mercury Distribution Ouachita Mountains**

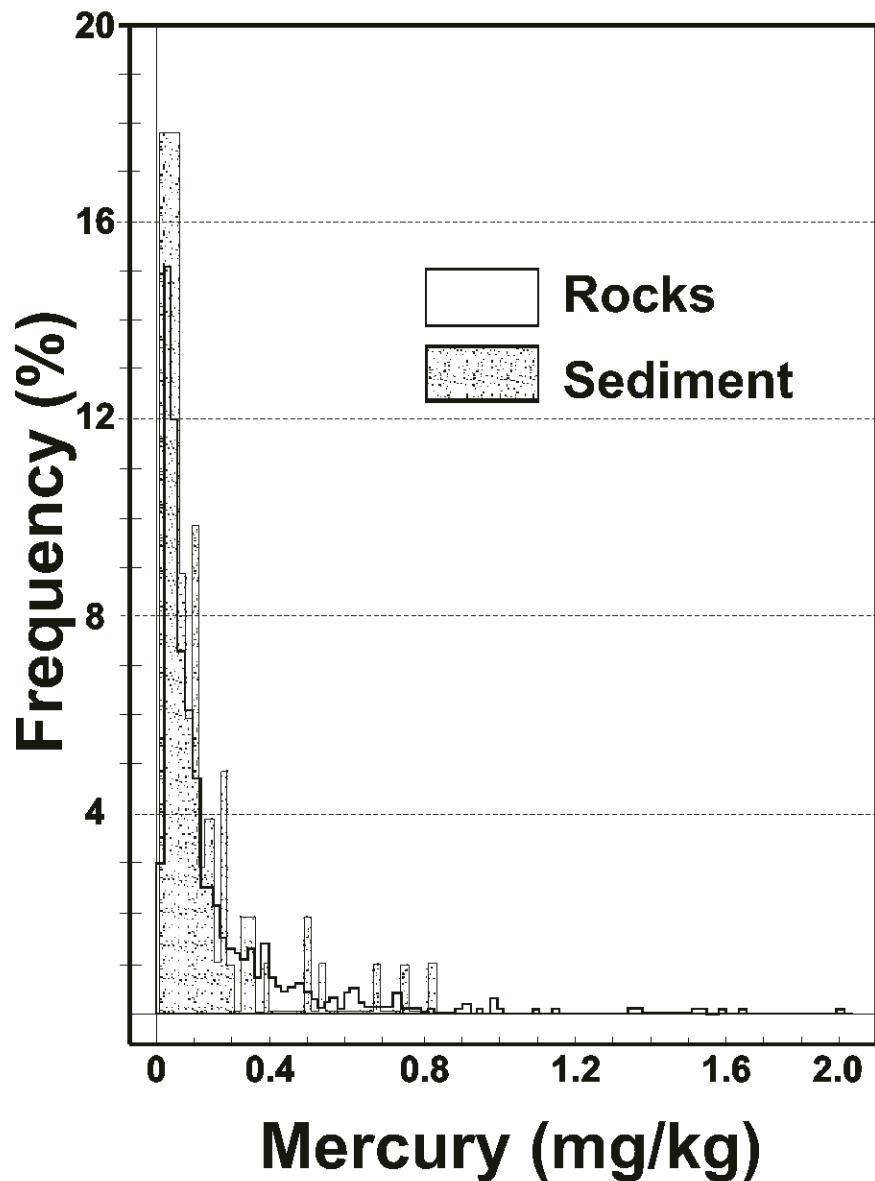


Figure 4.7. Distribution of mercury concentrations in sediment and rock samples from Stone et al. (1995).

## 5.0 MARGIN OF SAFETY, SEASONAL VARIATIONS, AND CRITICAL CONDITIONS

### 5.1 Margin of Safety

A margin of safety (MOS) accounts for uncertainty concerning the relationship between load allocations and water quality. In this case, it accounts for uncertainty and variability related to fish tissue mercury concentrations, estimates of loading, and the assumption of a linear relationship between fish tissue concentration and system load. This TMDL incorporates MOS factored into the reduction factors, the wasteload allocations, and the load allocations through conservative assumptions. Use of a target mercury level of 0.8 mg/kg for the Arkansas mercury fish consumption Action Level results in an explicit MOS of 20% for the TMDL.

### 5.2 Seasonal Variations and Critical Conditions

Wet deposition is greatest in the winter and spring seasons. Mercury loads fluctuate based on the amount and distribution of rainfall, and variability of localized and regional/global sources. The use of annual loads integrates short-term and seasonal variability. Inputs should continue to be estimated through wet deposition and additional monitoring.

Mercury methylation is expected to be highest during the summer. High temperatures promote biological activity, higher predator feeding rates, and anoxic conditions in lakes and reservoirs. These factors enhance mercury bioaccumulation during the summer months. However, given the long depuration times for fish and relatively mild winters in southern Arkansas, seasonal changes in fish tissue mercury body burden are expected to be relatively small. Inherent variability of mercury concentrations between individual fish of the same and/or different size categories is expected to be greater than seasonal variability.

Because of local geology, soils, natural vegetation, and topography, some areas of the Ouachita River and its tributaries are more susceptible to mercury methylation than others. For example, the steeper gradients in the upper portion of the Ouachita and Saline Rivers, without impoundments, results in generally lower fish tissue mercury concentrations. In the lower portion of the Ouachita and Saline Rivers and their tributaries, organic matter and sulfate concentrations are higher, and alkalinity and pH values are lower, which makes the systems more susceptible to

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mercury methylation. In addition, reservoirs are also likely contribute to the increased mercury concentrations in fish.

## **6.0 REASONABLE ASSURANCE: ONGOING AND FUTURE REDUCTIONS IN EMISSIONS**

Reasonable assurance is needed that water quality standards will be attained. Mechanisms to assess and control mercury loads, including strategies and regulatory controls, which would be national in scope, will aid implementation of TMDLs for specific basins. In addition, this TMDL will be reassessed periodically and may be modified to take into account available data and information, and the state of the science.

### **6.1 Regulatory Controls**

As rules and standards pursuant to the Clean Air Act have been developed, proposed, and promulgated since 1990, compliance by emitting sources as well as actions taken voluntarily have already begun to reduce emissions of mercury to the air across the U.S. EPA expects a combination of ongoing activities will continue to reduce mercury emissions to the air over the next decade. EPA currently regulates emissions of mercury and other hazardous air pollutants (HAPs) under the MACT program of Section 112 of the Clean Air Act, and under a corresponding new source performance standard (NSPS) program under Sections 111 and 129 of the Act. Section 112 authorizes EPA to address categories of major sources of HAPs, including mercury, by issuing emissions standards that, for new sources, are at least as stringent as the emissions control achieved by the best performing similar source in the category, and, for existing sources, are at least as stringent as the average of the best performing top 12% (or 5 facilities, whichever is greater) of similar sources. EPA may also apply these standards to smaller area sources, or choose to apply less stringent standards based on generally available control technologies (GACT). Sections 111 and 129 direct EPA to establish MACT-equivalent standards for each category of new and existing solid waste incineration units, regulating several specified air pollutants, including mercury.

In 1996 the U.S. eliminated the use of mercury in most batteries under the Mercury Containing and Rechargeable Battery Management Act. This action is reducing the mercury content of the waste stream which is further reducing mercury emissions from waste combustion. In addition, voluntary measures to reduce use of mercury containing products, such as the voluntary

measures committed to by the American Hospital Association, also will contribute to reduced emissions from waste combustion.

EPA expects to propose a regulation under Section 112 that will limit mercury emissions from chlor-alkali plants, chlorine production facilities which use the mercury cell technology. In addition, under the Integrated Urban Air Toxics Strategy, which was published in 1999, EPA is developing emissions standards under Section 112 for categories of smaller sources of air toxics, including mercury, that pose the greatest risk to human health in urban areas. These standards are expected to be issued by 2004.

## **6.2 Expected Reductions in Mercury Emissions**

Based on the EPA's NEI, the highest emitters of mercury to the air include coal-burning electric utilities, municipal waste combustors, medical waste incinerators (MWIs), chlor-alkali plants, and hazardous waste combustors (HWCs). EPA has issued a number of regulations under Sections 112, 111, and 129 to reduce mercury pollution from several of these source categories. Relevant regulations that EPA has established to date under the Clean Air Act include, among others, those listed below.

- The source category of municipal waste combustion (MWC) emitted about 20% of total national mercury emissions into the air in 1990. EPA issued final regulations under Sections 111 and 129 for large MWCs on October 31, 1995. Large combustors or incinerators must comply with the rule by December 2000. These regulations reduce mercury emissions from these facilities by about 90% from 1990 emission levels.
- MWIs emitted about 24% of total national mercury emissions into the air in 1990. EPA issued emission standards under Sections 111 and 129 for MWIs on August 15, 1997. When fully implemented, in 2002, EPA's final rule will reduce mercury emissions from MWIs by about 94% from 1990 emission levels.
- HWCs emitted about 2.5% of total national mercury emissions in 1990. In February 1999, EPA issued emission standards under Section 112 for these facilities, which include incinerators, cement kilns, and light weight aggregate kilns that burn hazardous waste. When fully implemented, these standards will reduce mercury emissions from HWCs by more than 50% from 1990 emission levels.

These promulgated regulations, when fully implemented and considered together with the actions discussed above that will reduce the mercury content of waste, are expected to reduce national mercury emissions caused by human activities by about 50% from 1990 levels.

In February 2002 President Bush announced the Clear Skies Initiative. This initiative proposed to reduce mercury emissions from power plants (electric utilities) by 69%. An intermediate cap of 26 tons of mercury per year was proposed for 2010. Current mercury emissions from power plants are 48 tons per year. EPA projections indicate that mercury emission from power plants in Region 6 will be reduced approximately 50%.

It is possible that the cumulative effect of additional standards and voluntary actions will reduce mercury emissions from human activities in the U.S. by more than 50% from 1990 levels. However, whether the overall, total percent reduction in national mercury emissions in the future will exceed 50% cannot be estimated at this time. EPA will continue to track emissions of mercury and evaluate additional approaches to reduce releases of mercury into the environment.

### **6.3 Mercury from Soils and Geologic Source**

A large portion of the mercury load comes from erosion of soils and geologic sources. Implementing best management practices (BMPs) in the watershed to reduce erosion would be expected to reduce the mercury load to the system. Reductions in atmospheric mercury will also reduce the accumulation of mercury in soils from atmospheric deposition. This will further reduce the mercury load to the system from soil erosion.

### **6.4 Recovery of Impaired Fishable Use**

Because of the persistence of mercury in tissue, it could take decades for mercury levels in predatory fish to drop as a result of reductions in mercury loading to the system. In addition, geology or other characteristics (such as DO levels) may cause some sites (such as Felsenthal NWR) to react more slowly to reductions in mercury loading. Therefore, an adaptive management approach is recommended for the portion of the Ouachita River system included in this TMDL study. This approach would include public education on the potential effects and sources of mercury, implementation of BMPs, and management of fisheries based on local characteristics. The goal should be to move toward use attainment while protecting human health.

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Effectiveness of regulatory controls and BMPs can be evaluated through monitoring of wet deposition rates at the LA10 site and fish tissue mercury concentrations in the basin.

## **7.0 PUBLIC PARTICIPATION**

When EPA establishes a TMDL, 40 CFR §130.7(d)(2) requires EPA to notify the public and seek comment concerning the TMDL. This TMDL was prepared under contract to EPA. After completion of this draft TMDL, EPA will commence preparation of a notice seeking comments, information and data from the general and affected public. If comments, data, or information are submitted during the public comment period, then the TMDL may be revised accordingly. After considering public comment, information, and data, and making any appropriate revisions, EPA will transmit the revised TMDL to the Arkansas Department of Environmental Quality for incorporation into the ADEQ current water quality management plans.

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## **APPENDIX A**

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**Table A1. NPDES Permit Facilities**

Table A1. Continued.

Pcs Permit Facility Npdas	Pcs Permit Facility City Name	Pcs Permit Facility County Name	Pcs Permit Facility Flow Rate (MGD)	Pcs Permit Facility Final Limits Issued	Pcs Permit Facility Major Discharge Indicator	Pcs Permit Facility Loc Name	Pcs Permit Original Permit Issue Date	Pcs Permit Facility Permit Expired Date	Pcs Permit Facility Permit Issued Date	Pcs Permit Facility River Basin Segment	Pcs Permit Facility Receiving Waters	Pcs Permit Facility Rivr Basin	Pcs Permit Facility Usage Hydro Basin Code	
AR0000558	Camden	Ouachita	F	6.5	International Paper Co.-Camden	M	10/07/74	1/31/02	1/23/1961 (002)	Ouachita Rv (001) & W Two Bu	10/1700	80	804201	
AR0000574	EI Dorado	Union	0.1B	Cooper Tire & Rubber Co		6/28/74	12/31/09	1/13/95	Dit Booye Ck Bu De Laure	10/1700	80	804202		
AR0000582	Bauhaus	Saline	F	10.8	Aluminum Company Of America	M	10/31/74	5/31/95	4/25/90	Humicane Ck Holly Ck Dry Losi	10/1700	60	804203	
AR0000581	Smackover	Union	0.65	Cross Oil Refining & Marketing	M	10/27/74	11/30/04	1/23/99	Smackover Ck (1-3) & Holmes Ck (4)	10/1700	80	804201		
AR0000647	EI Dorado	Union	2.73	Lion Oil Co-EI Dorado Refinery	M	11/27/74	8/30/03	8/31/88	Laure Ck Bu Deloitre	10/1700	80	804202		
AR0000683	Stephens	Ouachita	F	0.15	Berry Petroleum Co-Stephens	M	10/28/74	11/30/02	1/23/07	Trib Smackover Ck Ouachita	10/1700	80	804201	
AR0000640	EI Dorado	Union	F	1.19	Great Lakes Chemical Corp.		3/12/75	4/30/02	4/30/09	Gum Ck-Td (1) & Walker Ck-2a (2-3)	10/1700	80	804201	
AR0000732	EI Dorado	Union	F	2.431	EI Dorado Chemical Co. Inc.	M	10/22/74	1/31/95	12/28/89	Trib Faj Ck Haynes Ck	10/1700	70	804202	
AR0000841	Camden	Ouachita	F	100.8	Aero-Modell's Generating Stat		3/8/75	6/30/05	6/30/00	Quachita Rv	10/1700	80	804201	
AR0000876	Warren	Bradley	F	1.49	Poletich Corp-Badley Unit		1/19/74	1/23/104	1/13/09	Franklin Ck Saline Rv Ouachita	10/1700	80	804204	
AR0000914	Warren	Bradley	F	0.38	Potash Corp-Southern Unit		3/22/74	12/31/04	1/23/09	Rv	10/1700	80	804204	
AR0001112	Bauxite	Saline	F	0.01	Reynolds Metals Co-Humcane	M	10/12/74	8/31/00	8/31/05	Trib Hurricane Ck	10/1700	80	804203	
AR0001171	EI Dorado	Union		0.55	Great Lakes Chemical Corp.	M	1/25/75	4/30/03	1/31/58	Conne Bu	10/1700	80	804202	
AR0001210	Crossett	Ashley	F	0.55	Georgia Pacific-Crossett	M	1/27/74	10/31/91	10/31/86	Coffee Ck Ouachita Rv	10/1700	30	804202	
AR0001238	Malvern	Hut Spring	F	0.62	Borden Chemical Inc.	M	1/10/74	2/28/01	2/28/01	Hgt Ck Francis Ck Saline Rv	10/1700	80	804203	
AR0001668	Stephens	Ouachita	F	0.2	Stephens City Of	M	9/6/74	9/30/04	9/20/99	Smackover Ck Ouachita Rv	10/1700	80	804201	
AR0001440	Smackover	Union	F	0.51	Smackover City Of		12/12/74	3/31/03	3/31/68	Smyckover Ck Ouachita Rv	10/1700	60	804201	
AR0001474	Bearden	Ouachita	F	0.346	Bardeen City Of		1/28/74	8/30/04	8/30/99	Two Bayou Ck Ouachita Rv	10/1700	80	804201	
AR00021887	Strong	Union	F	0.31	Strong City Of		12/12/74	3/31/04	3/31/98	Lapie Ck Ouachita Rv	10/1700	50	804202	
AR00021895	Rison	Cleveland	F	0.31	Rison City Of		12/12/74	5/31/04	5/31/96	Trib Harrison Ck Saline Rv	10/1700	80	804204	
AR00021822	Monticello	Drew	F	1	Monticello City Of-West Plant	M	1/12/74	8/30/04	8/30/95	W 1-Mile Ck Saline Rv Ouachita	10/1700	80	804204	
AR00021831	Monticello	Drew	F	2.5	City Of Monticello East Plant	M	10/28/74	8/30/06	8/30/01	Goofy Ck	10/1700	80	804203	
AR00021873	Cathleen	E	0.3	Hamilton City Of		1/11/74	12/31/03	1/23/78	Champagroille Ck	10/1700	30	804201		
AR00022144	Walmet	Ashley	F	0.185	Walmet WWTF		9/21/74	1/31/03	1/31/98	Bayou Bartholemew	10/1700	20	804204	
AR00022268	Hutting	Union	F	0.138	Hutting City Of		10/21/74	12/31/04	12/31/99	Ouachita Rv	10/1700	80	804202	
AR00022365	Camden	Ouachita	F	3.2	Camden Water Utilities	M	7/27/6	4/30/02	4/30/07	W Two Bu (1) & Ouachita Rv	10/1700	80	804201	
AR0003375	Carthage	Dallas	F	0.09	Carthage City Of		10/31/86	12/31/02	12/31/97	Trib Mingo Crk	10/1700	80	804201	
AR0003373	EI Dorado	Union	F	7	EI Dorado City Of-South Wwp	M	5/30/74	3/6/02	3/31/02	3/31/97	Bu De Laure	10/1700	80	804202
AR0003376	Fordeye	Dallas	F	0.84	Fordeye City Of		4/30/74	11/30/00	9/30/04	Lt Brusly Ck Big Brusly Ck	10/1700	80	804201	
AR0003382	Ashley County	Ashley	F	0.45	North Crossell Utilities		1/12/74	1/12/74	8/20/99	Mil Ck Haynes Cr Smackover	10/1700	60	804201	
AR0003396	EI Dorado	Union	F	5	EI Dorado City Of-North Wwp	M	5/30/74	10/31/02	9/30/97	Ck Ouachita Rv	10/1700	60	804201	
AR00034002	Bryant	Saline	F	1	Bryant City Of		1/12/74	4/30/03	3/31/98	Ouachita Ck Saline Rv	10/1700	60	804203	
AR00034029	Hendrick	Ashley	F	0.94	City Of Hamborg		1/22/74	9/30/04	9/30/99	Chenier-a-Husat Crk	10/1700	11	802045	
AR00034201	Hot Springs Village	Garnett	F	1	Hot Springs Village Pwp		2/5/76	11/30/03	11/30/98	Mil Cr Middle Fk Arkansas Rv	10/1700	80	804203	
AR00034347	Sherridan	Grant	F	0.676	Sherridan City Of-South Wwp		11/5/74	11/30/04	10/31/99	Big Cr Hurricane Cr Saline Rv	10/1700	40	804203	
AR00034363	East Camden	Calhoun		1.5	Shumaker Public Service Corp.		12/16/74	4/30/03	3/31/98	Two Bu Crk	10/1700	80	804201	

Table A1. Continued.

Pcs Permit Facility Npdes	Pcs Permit Facility City Name	Pcs Permit Facility County Name	Pcs Permit Facility Final Limits Ind	Pcs Permit Facility Flow Rate (MGD)	Pcs Permit Facility Loc Name	Pcs Permit Facility Major Discharge Indicator	Pcs Permit Facility Original Permit Issue Date	Pcs Permit Facility Permit Issued Date	Pcs Permit Facility Received Waters	Pcs Permit Facility River Basin Segment	Pcs Permit Facility Stream Code
AR0034653	Morristown	Union	F	0.18	Nanphel City Of		2/21/75	5/31/05	S/3100/ Smackover Ck	101700	80420201
AR0036861	Thomaston	Cainhoun	F	0.05	Thornton City Of		2/21/75	12/31/01	Turners Cr. Champagnolle Ck	101700	80420201
AR0036955	Benton	Selma	F	0.02	Elymen		2/5/76	4/25/01	Jug Cr. Mono Cr.	101700	80420203
AR0036954	Foydsee	Dallas	F	0.357	Georgia Pacific-Fordyce		7/1/77	6/30/03	Trib Hurricane Ck	101700	80420201
AR0036702	E! Dorado	Saline	F	0.005	Georgia Pacific-Eldorado		11/9/76	1/31/01	1/3/16/00 Trib Bu! Louvre	101700	80420202
AR0036358	Hickok	Saline	F	0.6	Wekosh Alcyrs Llc		1/16/76	1/3/16/00	Decdon Cr. Trb	101700	80420203
AR0036498	Benton	Saline	F	0.05	Benton City Of-Wwtp	M	1/16/76	2/28/03	Trib Depot Cr. Saline Rv	101700	80420203
AR0037141	Parkdale	Ashley	F	0.02	City of Parkdale WWTF		10/31/08	4/20/03	4/3/05/90 Bayou Bartholemew	101700	80219405
AR0037559	Benton	Saline	F	0.02	Cedar Hill Investments-Oak Fox		7/3/78	1/31/02	1/3/16/97 Hurricane Cr. Trib.	101700	80420203
AR0037731	Lovett	Quachita	F	0.03	Beech Springs Baptist Church		10/24/79	7/31/00	7/31/95 Quachita Rv trib	101700	80420201
AR0037800	E! Dorado Twp	Union	F	1.29	Enisco Inc	M	3/19/81	5/31/04	4/3/05/99 Boycey Cr.	101700	80420202
AR0037885	Jefferson County	Jefferson	F	0.025	Boggy Bayou SID		11/27/71	12/31/01	12/31/96 Barren/tonnew	101000	80219405
AR0038211	Callion	Union	F	0.112	Calion City Of		8/28/2	5/31/02	5/31/97 Chappells Slu Quachita Rv & Rb	101700	80420201
AR0038989	Hermitage	Bradley	F	0.07	Hermitage City Of-Slp		4/25/94	7/31/03	7/3/16/90 Big Town Cr. Little Cr Saline	101700	80420204
AR0039144	Jefferson County	Jefferson	F	0.05	Pinewood SID #1		2/28/92	3/31/02	3/31/97 Trib Neivins Cr.	101000	80219405
AR0039284	Hol Springs Village	Geffund	F	0.5	Hat Springs Village-Cedar Cr.		10/31/88	11/20/04	11/30/99 Cedar Cr. South Fork Saline Rv	101700	80420203
AR0039659	Felsenthal	Linton	F	0.048	Felsenthal Town Cr		6/29/83	4/25/03	4/3/05/99 Wof. Slope	101700	80420203
AR0044076	Wintar	Drew	F	0.12	Wilmar City Of		5/15/84	3/31/05	3/3/10/00 Flat Branch Cr. Ten Mile Cr	101700	80420204
AR0044517	Louvann	Quachita	F	0.064	Lovin City Of		8/28/4	3/31/01	3/3/16/96 Bruley Cr. Smackover Cr.	101700	80420201
AR0044297	Monrose	Ashley	F	0.1	City of Monroe WWTF		10/18/85	6/20/08	Wards Bayou (JA) & Bayou Barren/tonnew (2B)	101700	80219405
AR0044116	Benton	Saline	F	0.012	Timber Ridge Natural Gas Lab		5/29/87	11/30/02	11/30/97 Henderson Cr. N Flk/Saline Rv	101700	80420203
AR0044162	Fire Buff	Jefferson	F	0.012	Suburbia SID #1-Jefferson City		10/31/86	9/30/03	9/30/98 Neivin Cr. Bayou Barren/tonnew	101700	80219405
AR0042128	Bryant	Saline	F	0.004	Pearlrove Village Pca		9/30/86	9/30/91	9/30/86 Trace Cr. Trib Saline Rv	101700	80420203
AR0042227	Banton	Saline	F	0.013	Crosscut Harbor Port Authority		3/30/87	9/30/02	11/30/02 11/30/97 Trace Cr. Rv	101700	80420202
AR0042213	Crosscut	Ashley	F	0.005	Fountain Hill City Of-Wwtp		3/30/87	8/31/02	8/31/97 Flat Cr. Trib Saline Rv	101700	2
AR0042421	Fountain Hill	Ashley	F	0.072	Harnell City Of		7/31/87	10/31/02	10/31/97 Spring Bl. Basin Cr. Lloyd Cr. Mingo Cr.	101700	80420201
AR0042809	Harnell	Campbell	F	0.01	J.J.S. Truck Stop Inc		1/26/88	2/28/03	2/28/98 Saline R.	101000	80420203
AR0042889	Benton	Saline	F	0.3	Farm Fresh Catfish Company		6/28/89	11/30/04	11/30/99 Trib Saline Rv	101700	80420203
AR0043257	Leela	Grant	F	2	Warren City Of-Slp	M	2/23/89	1/31/03	1/31/98 Saline R.	101700	80420204
AR0043427	Warren	Bradley	F	0.061	Kingsland City Of		1/3/90	1/31/05	1/31/00 Rv	101700	80420204
AR0043672	Kingsland	Cleveland	F	0.025	Fountain Lake School Dist 18		11/30/89	9/30/04	9/30/99 Trace Cr. Rv	101700	80420203
AR0044275	Hol Springs	Garland	F	0.362	Willmette Industries-Milvern		3/29/91	4/20/06	4/20/96 Trib Big Cr. Saline Rv	101700	80420203
AR0044105	Milvern	Hol Spring	F	0.018	Alcea Road Mobile Home Park		5/23/89	8/31/04	8/31/98 Trib Cr. Rv	101700	80420203
AR0044156	Benton	Cayden	F	0.018	Jessville Public School		3/28/89	7/31/04	7/31/99 Trib Colerain Cr. Saline Rv	101700	80420203
AR0044423	Jessville	Ashley County	F	0.011	Jordan Town Mhp		11/30/89	7/31/04	7/31/99 Trib Bell Branch	101700	80420202
AR0044482	Benton	Saline	F	0.01	Branch Hollow Mobile Home Park		1/31/91	2/28/01	2/28/96 Hurricane Cr.	101700	80420203
AR0044652	Benton	Saline	F	0.013	Hurricane Lake Mhp		8/30/89	9/30/04	9/31/99 Hurricane Cr. Saline Rv	101700	80420203

Table A1. Continued.

Pcs Permit Facility Npdes	Pcs Permit Facility City Name	Pcs Permit Facility County Name	Pcs Permit Facility Final Limit Ind	Pcs Permit Facility Flow Rate (MGD)	Pcs Permit Facility Loc Name	Pcs Permit Facility Major Discharge Indicator	Pcs Permit Facility Original Permit Issue Date	Pcs Permit Facility Permit Expired Date	Pcs Permit Facility Received Waters	Pcs Permit Facility River Basin	Pcs Permit Facility Stream Segment	Pcs Permit Facility Hydro Basin Code
AR0044733	EI Dorado	Union	F	0.011	Wildwood Trailer Park		2/27/80	6/30/00	6/30/95 Smackover Crk	101700		8040201
AR0045047	Holt Springs	Girard	F	0.011	Village Square Shopping Center		8/30/80	4/30/01	4/30/96 Trib Mill Cr Saline Rv	101700		8040203
AR0045233	East Camden	Caldwell	F	0.003	Lockhead Martin Missiles & Fire		4/25/90	6/30/00	6/30/95 Trib Logist Bu	101700		8040201
AR0045559	Smackover	Union	F	0.003	Wesco Inc		8/30/91	11/30/01	10/31/96 Sh Holmes Crk	101700		8040201
AR0045838	Star City	Lincoln	F	0.01	AR Parks & Tourism - Cane Creek		1/31/92	3/31/02	3/31/97 Cane Crk	101700		8020405
AR0045926	Camden	Ouachita	F		International Paper-Cullendale		8/31/92	6/30/04	5/31/98 Trib wo Eu	101700		8040202
AR0046116	Hutg	Union		0.039	Plum Creek Manufacturing L P		4/30/92	12/31/04	Dollar St (12); Buckhorn Stu	101700		8040202
AR0046141	Mountain Valley	Girard	F	0.025	Mountain Valley Retreat Center		12/31/91	1/31/02	1/31/97 Trib S Fl Saline Rv	101700		8040203
AR0046451	Forchey	Dallas	F	0.022	Anthony Timberlands Inc-Fordy		9/30/92	1/31/04	1/31/99 Del Jug Crk	101700		8040201
AR0046477	Star City	Lincoln	F	0.375	City of Star City MWT		8/31/93	11/30/03	11/3/98 Cane Crk Esgou Bartholemew	101700		8020405
AR0046598	Leola	Grant	F	0.038	International Paper Co-Ledie		7/31/94	9/30/02	8/31/97 Trib Saline Rv	101700		8040203
AR0046817	Malvern	Hot Spring	F	0.024	Glen Rose Public School		3/31/95	11/30/03	11/30/98 Trib W Ma Crk	101700		8040203
AR0047210	Bryant	Salis	F	0.025	Salem Sewer Improvement Dist10		8/30/95	9/30/00	9/30/95 Trib Hurricane Crk Saline Rv	101700		8040203
AR0047250	Monticello	Drew	F	0.0075	Pine Haven Mobile Lodge		7/31/94	8/31/04	8/31/98 Godfrey Cr trib Culver Crk	101700		8020405
AR0047298	EI Dorado	Union	F	2.4	Columbian Chemical Company		7/31/95	7/31/00	8/31/98 Bayou Bartholemew	101700		8040201
AR0047334	Lubana	AR0047331	Benton	0.156	Anthony Forest Products Co		3/31/94	4/30/99	4/30/98 Cynth Mash Lopis Crk	101700		8040202
AR0047333	Saline	F	0.033	Pathway Campground-Ark Church		2/28/94	3/31/04	3/31/98 Quachila R	101700		8040203	
AR0047503	Carthage	Dallas	F	0.01	Idaho Timber Corp. Of Camargue		11/30/94	12/31/04	12/3/98 Trib Mono Crk Ouachilla Rv	101700		8040201
AR0047732	Monticello	Drew	F	0.031	J.P. Price Lumber Company		1/31/95	11/30/04	11/30/99 Trib Coon Crk Saline Rv	101700		8040204
AR0047730	Warren	Bradley	F	0.030	Robbins Sykes Fishing		6/30/95	7/31/00	6/30/95 Saline Rv Inta	101700		8040204
AR0047730	Hermings	Bradley	F		Johnsville Sand & Gravel		5/31/95	5/31/05	5/31/00 Hunt Br Saline Rv	101700		8040204
AR0047812	Star City	Lincoln	F	0.0255	Robert Floyd Sawmill Inc.		3/31/95	1/31/05	Trib. Cane Cr. Bayou Bartholemew	101700		8020406
AR0047902	Leola	Grant	F	0.03	H. G. Tolier & Son Lumber Co.		3/31/95	3/31/00	3/31/98 Trib Saline Rv	101700		8040203
AR0048003	Bauxite	Saline	F	0.001	Alumina & Ceramic Lab-Makoff		8/31/95	8/31/00	8/31/95 Del Humiture Cr Saline Rv	101700		8040203
AR0048046	Camden	Ouachita	F	3.2753	Rogers Lumber Co. Of Camden		8/31/95	8/31/00	8/31/95 Ouachilla Cr Big Brushy	101700		8040201
AR0048087	Crossell	Ashley			Georgia Pacific-North Log Yard		3/31/90	3/31/01	3/31/95 Crk	101700		8040202
AR0048115	Bauville	Saline	F	0.025	Bauxite Public School Dist #14		2/29/90	2/28/01	2/29/95 Trib Holly Cr Saline Rv	101700		8040203
AR0048184	Jessieville	Girard	F	0.01	North Garland Co. Youth Center		4/30/90	4/30/01	4/30/96 Trib Coleman Cr Md Fr Saline Rv	101700		8040203
AR0048259	Bauville	Saline	F	0.012	Bauxite School Dist 14-Plant 2		2/29/90	2/28/01	2/29/95 Hurricane Crk Saline Rv	101700		8040203
AR0048391	Mount Holly	Union		2	Watson Tee Mill & Logging Inc.		10/31/90	10/31/01	10/31/95 Beech Cr Smackover Crk	101700		8040201
AR0048445	Poyen	Grant	F	0.05	Poyen City Oh-Msp		3/31/90	3/31/04	3/31/99 Trib Big Cr Francois Cr Saline Rv	101700		8040203
AR0048589	Risen	Cleveland	F	0.004	Woodlawn School District #6		10/31/97	10/31/02	10/31/97 Trib Hudgin Cr Saline Rv	101700		8040204
AR0049018	Benton	Saline		0.56	Benton City Of-Hurricane Lake				Hurricane Cr Saline Rv	101700		8040203
AR0049123	Mount Holly	Union	F	0.005	Mr. Holly School Wastewater Sys		4/30/00	4/30/05	4/30/00 Smackover Crk	101700		8040201

Table A1. Continued.

Pcs Permit Facility Npds	Pcs Permit Facility City Name	Pcs Permit Facility County Name	Pcs Permit Facility Final Limits Ind	Pcs Permit Facility Flow Rate (MGD)	Pcs Permit Facility Loc Name	Pcs Permit Major Discharge Indicator	Pcs Permit Facility Major Permit Issue Date	Pcs Permit Facility Original Permit Issue Date	Pcs Permit Facility Received Waters	Pcs Permit Facility Issued Date	Pcs Permit Facility Stream Segment	Pcs Permit Facility River Basin	Pcs Permit Facility Usg Hydro Basin Code
AR0049140	El Dorado	Union	F	4.9	Union Generating Station		4/30/000	4/30/000	Quachita Rv	101700		8040202	
ARG160026	El Dorado	Union	F	0.06	Waste Mgt Ctr Inc-Union Co.		9/26/99	8/31/04	Trib Franklin Ck	101700		8040202	
ARG160027	Hempburg	Ashley	F	0.115	Ashley Ctrly Landfill		7/31/99	8/31/04	Trib Hanks Ck	101700		8040202	
ARG340050	El Dorado	Union	F	0.0001	Central Oil & Supply Corp		10/31/94	3/31/05	2/26/00 Del Lapile Ck	101700		8040202	
ARG550203	Strong	Ouachita	F	0.0016	Ebenezer Baptist Church		4/1/91	4/30/03	4/30/98 Del Locust Bu	101700		8040202	
ARG550215	East Carrollton	Saline	F	0.0001	Day & Zimmerman American Freightways-Cangs		4/1/91	4/30/03	4/30/98 Hurricane Lk Trib	101700		8040202	
ARG840110	Friberg	Jefferson	F	0.0001	Hay 15 Water Users Association		8/18/93	10/31/04	9/30/99 Bayou Burholme	101700		8020405	
ARG840117	Cleveland County	Cleveland	F	0.425	Hay 15 Water Users		3/31/94	10/31/04	9/30/99 Hudson Cr.	101700		8040204	
ARG640121	Shoordan	Grant	F	0.9	S.Sheridan-L Creek Walkworks		3/31/94	10/31/04	9/30/99 Trib Hurricane Crk	101700		8040203	
ARG640143	Fountain Hill	Ashley	F	0.0018	City of Fountain Hill PW IP		9/30/99	10/31/04	9/30/99 Fountain Crk	101700		8020402	
ARG750069	El Dorado	Union	F	0.115	Gel-Rid-Oil Of Air		5/31/94	7/31/04	7/31/99 Del Lk Larenthal Arkansas Rv	101700		8040201	
ARG750074	Pine Buff	Jefferson	F	0.0002	Rasmussen Group Inc.		7/31/99	7/31/04	7/31/99 Del Lk Larenthal Arkansas Rv	101000		8040203	
ARG790034	Pine Buff	Jefferson	F	0.038	Marco Petroleum #320		1/31/95	1/31/06	1/31/01 Lk Benholone New SC	101000		8020405	
ARG790056	Wilmet	Ashley	F	0.017	E-Z Mart Store #348	M	1/31/95	1/31/06	1/31/01 Lk Enterprise	101700		8040202	
LA0007579	Sterlington	Ouachita	F	0.0001	Energy Louisiana Inc.	M	4/12/75	10/31/97	8/30/92 Ouachita River	101700		8040202	
LA0007854	Sterlington	Ouachita	F	0.0001	Angus Chem Co	M	1/27/74	10/31/99	9/30/94 Basin	101700		8040202	
LA0043166	Marsin	Union	F	0.26			2/17/75	12/9/93	12/6/98 Big Creek	101700	20	8040202	
LA0246109	Sterlington	Ouachita	F	0.15			10/30/75	6/30/99	6/27/94 Basin	101700	20	8040202	
LA0700117	Bastrop	Morehouse			Texas Gas Transm Corp				Chemin de-laut Bayou	101700		8020405	
LA0701123	Bastrop	Morehouse			International Paper-Yard #204				Banholone	101700		8040205	
LA0100811	Union	Saint James			Consagra Poultry - Farmerville				Cypress Bayou	102100		8040202	
LA0102319	Bastrop	Morehouse			Geo Specialty Chern				Humicuit Creek	102100		8040202	
									Little Bayou Beauf Vietnam	101700		8020405	
									Beckie Bayou LeTourche	101700		8020405	

## **APPENDIX B**

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**Table B1. Local Mercury Emission Sources**

Table B.1 1999 Airshed Point Source Mercury Emissions from NEI.

05039	Arkansas	Dallas	2.0376E-06 TON	107
05039	Arkansas	Dallas	2.0376E-06 TON	107
05039	Arkansas	Dallas	2.0376E-06 TON	107
05039	Arkansas	Dallas	2.0376E-06 TON	107
05039	Arkansas	Dallas	6.44519E-05 TON	107
05039	Arkansas	Dallas	0.000594758 TON	107
05039	Arkansas	Dallas	5.28566E-05 TON	107
05039	Arkansas	Dallas	0.000589857 TON	107
05039	Arkansas	Dallas	0.000589857 TON	107
05039	Arkansas	Dallas	0.000589857 TON	107
05039	Arkansas	Dallas	5.28566E-05 TON	107
05041	Arkansas	Desha	0.00009224 TON	1626-2
05041	Arkansas	Desha	0.00718673 TON	1626-2
05041	Arkansas	Desha	0.00000962 TON	1626-2
05041	Arkansas	Desha	4.33863E-07 TON	802
05045	Arkansas	Faulkner	6.49073E-06 TON	802
05047	Arkansas	Franklin	0.08 TON	1808-2
05051	Arkansas	Garland	4.01027E-05 TON	107
05051	Arkansas	Garland	0.000276076 TON	107
05051	Arkansas	Garland	4.01027E-05 TON	107
05051	Arkansas	Garland	4.01027E-05 TON	107
05051	Arkansas	Garland	5.28566E-05 TON	107
05051	Arkansas	Garland	0.000363877 TON	107
05051	Arkansas	Garland	5.28566E-05 TON	107
05051	Arkansas	Garland	5.28566E-05 TON	107
05051	Arkansas	Garland	2.35687E-07 TON	802
05053	Arkansas	Grant	0.000451248 TON	107
05053	Arkansas	Grant	0.000451248 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000452488 TON	107
05053	Arkansas	Grant	0.000583321 TON	107
05053	Arkansas	Grant	3.8316E-05 TON	107
05057	Arkansas	Hempstead	0.000141609 TON	107

05057	Arkansas	Hempstead	3.75638E-07 TON	802
05057	Arkansas	Hempstead	4.33863E-07 TON	802
05059	Arkansas	Hot Spring	1.05228E-05 TON	107
05059	Arkansas	Hot Spring	3.41991E-06 TON	107
05059	Arkansas	Hot Spring	3.41991E-06 TON	107
05059	Arkansas	Hot Spring	1.05228E-05 TON	107
05059	Arkansas	Hot Spring	0.000524227 TON	107
05059	Arkansas	Hot Spring	0.000524227 TON	107
05059	Arkansas	Hot Spring	0.000490186 TON	107
05059	Arkansas	Hot Spring	0.000571882 TON	107
05059	Arkansas	Hot Spring	0.00012983 TON	107
05061	Arkansas	Howard	0.000458484 TON	107
05061	Arkansas	Howard	0.000343863 TON	107
05061	Arkansas	Howard	0.000100177 TON	107
05061	Arkansas	Howard	0.000325574 TON	107
05061	Arkansas	Howard	5.57023E-06 TON	802
05061	Arkansas	Howard	4.60421E-06 TON	802
05069	Arkansas	Jefferson	0.00002819 TON	1626-2
05069	Arkansas	Jefferson	0.00270871 TON	1626-2
05069	Arkansas	Jefferson	0.00000363 TON	1626-2
05069	Arkansas	Jefferson	0.00010249 TON	1626-2
05069	Arkansas	Jefferson	0.00010249 TON	1626-2
05069	Arkansas	Jefferson	0.00290378 TON	1626-2
05069	Arkansas	Jefferson	0.00290378 TON	1626-2
05069	Arkansas	Jefferson	0.0090077 TON	1626-2
05069	Arkansas	Jefferson	0.00000389 TON	1626-2
05069	Arkansas	Jefferson	0.00000389 TON	1626-2
05069	Arkansas	Jefferson	0.00001206 TON	1626-2
05069	Arkansas	Jefferson	0.000415045 TON	1808-3
05069	Arkansas	Jefferson	0.000242676 TON	1808-3
05069	Arkansas	Jefferson	0.000166961 TON	107
05069	Arkansas	Jefferson	2.94738E-05 TON	107
05069	Arkansas	Jefferson	0.000563318 TON	107
05069	Arkansas	Jefferson	5.28566E-05 TON	107
05069	Arkansas	Jefferson	0.000677667 TON	107
05069	Arkansas	Jefferson	53.39588292 G	0801-2
05069	Arkansas	Jefferson	8.59026E-06 TON	802
05069	Arkansas	Jefferson	1.67261E-05 TON	802
05073	Arkansas	Lafayette	6.91923E-05 TON	107
05073	Arkansas	Lafayette	1.17565E-06 TON	802
05081	Arkansas	Little River	0.00022548 TON	1626-2
05081	Arkansas	Little River	0.00022548 TON	1626-2
05081	Arkansas	Little River	0.0150579 TON	1626-2
05081	Arkansas	Little River	0.01577657 TON	1626-2
05081	Arkansas	Little River	0.00002015 TON	1626-2
05081	Arkansas	Little River	0.00002112 TON	1626-2
05081	Arkansas	Little River	0.00201 TON	107
05081	Arkansas	Little River	0.00241 TON	107
05081	Arkansas	Little River	5.28566E-05 TON	107
05081	Arkansas	Little River	0.000596392 TON	107
05081	Arkansas	Little River	0.001654901 TON	107

05081	Arkansas	Little River	0.00121499 TON	107
05081	Arkansas	Little River	444.3374904 G	0801-3
05081	Arkansas	Little River	28446.22846 G	0801-3
05081	Arkansas	Little River	197382.7003 G	0801-3
05081	Arkansas	Little River	3.41288E-07 TON	802
05083	Arkansas	Logan	4.66346E-07 TON	802
05099	Arkansas	Nevada	0.000451248 TON	107
05099	Arkansas	Nevada	2.82405E-07 TON	802
05103	Arkansas	Ouachita	0.00007431 TON	1626-2
05103	Arkansas	Ouachita	0.00513338 TON	1626-2
05103	Arkansas	Ouachita	0.00282336 TON	1626-2
05103	Arkansas	Ouachita	0.00282336 TON	1626-2
05103	Arkansas	Ouachita	0.00000687 TON	1626-2
05103	Arkansas	Ouachita	0.00000378 TON	1626-2
05103	Arkansas	Ouachita	0.00000378 TON	1626-2
05103	Arkansas	Ouachita	4.79456E-06 TON	1808-3
05103	Arkansas	Ouachita	0.000594758 TON	107
05103	Arkansas	Ouachita	0.000594758 TON	107
05103	Arkansas	Ouachita	0.000544652 TON	107
05103	Arkansas	Ouachita	0.000544652 TON	107
05103	Arkansas	Ouachita	0.000544652 TON	107
05103	Arkansas	Ouachita	5.28566E-05 TON	107
05103	Arkansas	Ouachita	0.000506583 TON	107
05103	Arkansas	Ouachita	1.49802E-05 TON	107
05103	Arkansas	Ouachita	1.49802E-05 TON	107
05103	Arkansas	Ouachita	1.60878E-05 TON	107
05103	Arkansas	Ouachita	1.60878E-05 TON	107
05103	Arkansas	Ouachita	1.33585E-08 TON	802
05103	Arkansas	Ouachita	9.53375E-07 TON	802
05103	Arkansas	Ouachita	1.29528E-07 TON	802
05107	Arkansas	Phillips	3.17091E-08 TON	802
05107	Arkansas	Phillips	4.14111E-07 TON	802
05109	Arkansas	Pike	4.04509E-05 TON	107
05109	Arkansas	Pike	3.18902E-07 TON	802
05113	Arkansas	Polk	3.68752E-07 TON	802
05115	Arkansas	Pope	1.914E-06 TON	802
05117	Arkansas	Prairie	8.38445E-06 TON	802
05117	Arkansas	Prairie	3.4029E-06 TON	802
05119	Arkansas	Pulaski	0.000107853 TON	107
05119	Arkansas	Pulaski	0.000431104 TON	107
05119	Arkansas	Pulaski	4.80212E-07 TON	105
05119	Arkansas	Pulaski	9.13832E-06 TON	105
05119	Arkansas	Pulaski	0.000339863 TON	107
05119	Arkansas	Pulaski	0.000254897 TON	107
05119	Arkansas	Pulaski	0.000568208 TON	107
05119	Arkansas	Pulaski	6.75211E-05 TON	107
05119	Arkansas	Pulaski	6.84858E-05 TON	107
05119	Arkansas	Pulaski	6.84858E-05 TON	107
05119	Arkansas	Pulaski	2.73824E-05 TON	802
05119	Arkansas	Pulaski	5.14589E-06 TON	802

05119	Arkansas	Pulaski	3.66676E-06 TON	802
05125	Arkansas	Saline	3.38733E-06 TON	802
05125	Arkansas	Saline	1.19845E-05 TON	802
05127	Arkansas	Scott	0.000435753 TON	107
05127	Arkansas	Scott	0.000435753 TON	107
05127	Arkansas	Scott	0.000574335 TON	107
05127	Arkansas	Scott	0.000574335 TON	107
05127	Arkansas	Scott	5.02098E-07 TON	802
05131	Arkansas	Sebastian	1.19236E-06 TON	105
05131	Arkansas	Sebastian	1.75002E-07 TON	105
05131	Arkansas	Sebastian	4.22188E-06 TON	802
05133	Arkansas	Sevier	4.49626E-07 TON	802
05139	Arkansas	Union	4.01027E-05 TON	107
05139	Arkansas	Union	0.00012247 TON	107
05139	Arkansas	Union	2.38473E-06 TON	105
05139	Arkansas	Union	0.000451248 TON	107
05139	Arkansas	Union	0.000170203 TON	107
05139	Arkansas	Union	0.000594758 TON	107
05139	Arkansas	Union	12414.71459 G	0801-1
05139	Arkansas	Union	24829.42918 G	0801-1
05139	Arkansas	Union	1.34151E-05 TON	107
05139	Arkansas	Union	1.34151E-05 TON	107
05139	Arkansas	Union	1.34151E-05 TON	107
05139	Arkansas	Union	1.82175E-05 TON	107
05139	Arkansas	Union	1.82175E-05 TON	107
05139	Arkansas	Union	9.22286E-05 TON	107
05139	Arkansas	Union	9.22286E-05 TON	107
05139	Arkansas	Union	9.22286E-05 TON	107
05139	Arkansas	Union	9.22286E-05 TON	107
05139	Arkansas	Union	9.22286E-05 TON	107
05139	Arkansas	Union	0.002899977 TON	502
05139	Arkansas	Union	7.77135E-05 TON	107
05139	Arkansas	Union	7.77135E-05 TON	107
05139	Arkansas	Union	7.77135E-05 TON	107
05139	Arkansas	Union	7.77135E-05 TON	107
05139	Arkansas	Union	7.77135E-05 TON	107
05139	Arkansas	Union	7.77135E-05 TON	107
05139	Arkansas	Union	7.77135E-05 TON	107
05139	Arkansas	Union	7.14467E-06 TON	802
05139	Arkansas	Union	2 LB	
05141	Arkansas	Van Buren	1.9276E-06 TON	802
05145	Arkansas	White	2.38473E-06 TON	105
05145	Arkansas	White	5.28566E-05 TON	107
05145	Arkansas	White	2.42608E-05 TON	107
05145	Arkansas	White	2.32414E-07 TON	802
05145	Arkansas	White	1.21872E-06 TON	802
05147	Arkansas	Woodruff	0.2 TON	1808-2
05149	Arkansas	Yell	2.91726E-06 TON	802
22009	Louisiana	Avoyelles	6.40007E-06 TON	0802
22013	Louisiana	Bienville	0.000132752 TON	0107
22013	Louisiana	Bienville	8.18353E-05 TON	0107
22013	Louisiana	Bienville	1.79131E-07 TON	0105

22015	Louisiana	Bossier	3.79951E-06 TON	0105
22015	Louisiana	Bossier	6.47714E-07 TON	0105
22015	Louisiana	Bossier	2.12405E-05 TON	0107
22015	Louisiana	Bossier	2.12405E-05 TON	0107
22015	Louisiana	Bossier	2.12405E-05 TON	0107
22015	Louisiana	Bossier	7.93085E-05 TON	0107
22015	Louisiana	Bossier	7.93085E-05 TON	0107
22015	Louisiana	Bossier	7.89722E-06 TON	0802
22017	Louisiana	Caddo	0.000103296 TON	0107
22017	Louisiana	Caddo	0.000103296 TON	0107
22017	Louisiana	Caddo	0.000103296 TON	0107
22017	Louisiana	Caddo	0.000887119 TON	0502
22017	Louisiana	Caddo	8.11808E-05 TON	0107
22017	Louisiana	Caddo	8.11808E-05 TON	0107
22017	Louisiana	Caddo	8.11808E-05 TON	0107
22017	Louisiana	Caddo	8.11808E-05 TON	0107
22017	Louisiana	Caddo	1.24922E-05 TON	0802
22017	Louisiana	Caddo	4.44709E-05 TON	0802
22021	Louisiana	Caldwell	1.7566E-06 TON	0802
22027	Louisiana	Claiborn	6.40007E-06 TON	0802
22043	Louisiana	Grant	0.000026792 TON	0107
22043	Louisiana	Grant	6.6874E-05 TON	0107
22043	Louisiana	Grant	8.00366E-05 TON	0107
22043	Louisiana	Grant	4.82276E-07 TON	0105
22049	Louisiana	Jackson	0.00012043 TON	1626-2
22049	Louisiana	Jackson	0.00009993 TON	1626-2
22049	Louisiana	Jackson	0.0082134 TON	1626-2
22049	Louisiana	Jackson	0.01396278 TON	1626-2
22049	Louisiana	Jackson	0.00000425 TON	1626-2
22049	Louisiana	Jackson	0.00001869 TON	1626-2
22049	Louisiana	Jackson	0.000157311 TON	0107
22049	Louisiana	Jackson	0.000026792 TON	0107
22049	Louisiana	Jackson	0.001424446 TON	0107
22049	Louisiana	Jackson	0.000026792 TON	0107
22059	Louisiana	La Salle	2 LB	
22059	Louisiana	La Salle	1 LB	
22059	Louisiana	La Salle	6.46273E-06 TON	0802
22061	Louisiana	Lincoln	7.88217E-05 TON	0107
22061	Louisiana	Lincoln	3.03731E-05 TON	0107
22061	Louisiana	Lincoln	5.01567E-07 TON	0105
22061	Louisiana	Lincoln	1.8693E-08 TON	0802
22067	Louisiana	Morehouse	2 LB	1626-2
22067	Louisiana	Morehouse	37.5 LB	
22067	Louisiana	Morehouse	37.5 LB	0107
22067	Louisiana	Morehouse	5 LB	1626-2
22067	Louisiana	Morehouse	5 LB	1626-2
22069	Louisiana	Natchitoches	7 LB	1626-2
22069	Louisiana	Natchitoches	8 LB	1626-2
22069	Louisiana	Natchitoches	1 LB	1626-1

22073	Louisiana	Ouachita	0.285714286 LB	
22073	Louisiana	Ouachita	0.285714286 LB	
22073	Louisiana	Ouachita	0.285714286 LB	0107
22073	Louisiana	Ouachita	0.285714286 LB	
22073	Louisiana	Ouachita	0.285714286 LB	
22073	Louisiana	Ouachita	0.285714286 LB	
22073	Louisiana	Ouachita	0.285714286 LB	
22073	Louisiana	Ouachita	1 LB	1626-2
22073	Louisiana	Ouachita	1 LB	0107
22073	Louisiana	Ouachita	1 LB	1626-2
22073	Louisiana	Ouachita	1 LB	
22073	Louisiana	Ouachita	1.333333333 LB	1626-2
22073	Louisiana	Ouachita	1.333333333 LB	
22073	Louisiana	Ouachita	1.333333333 LB	0107
22073	Louisiana	Ouachita	1.666666667 LB	1626-2
22073	Louisiana	Ouachita	1.666666667 LB	
22073	Louisiana	Ouachita	1.666666667 LB	0107
22073	Louisiana	Ouachita	1.666666667 LB	1626-2
22073	Louisiana	Ouachita	1.666666667 LB	
22073	Louisiana	Ouachita	1.666666667 LB	0107
22073	Louisiana	Ouachita	2.66717E-05 TON	1808-3
22073	Louisiana	Ouachita	2.16244E-05 TON	0802
22073	Louisiana	Ouachita	1.66477E-05 TON	0802
22079	Louisiana	Rapides	9.5 LB	0107
22079	Louisiana	Rapides	9.5 LB	1626-2
22079	Louisiana	Rapides	1 LB	1626-2
22079	Louisiana	Rapides	40 LB	
22079	Louisiana	Rapides	2.67707E-05 TON	1808-3
22079	Louisiana	Rapides	6.8839E-05 TON	1808-3
22079	Louisiana	Rapides	1.92958E-05 TON	0802
22079	Louisiana	Rapides	5.93591E-07 TON	0802
22081	Louisiana	Red River	3.59626E-05 TON	0107
22081	Louisiana	Red River	3.59626E-05 TON	0107
22107	Louisiana	Tensas	6.29993E-07 TON	0802
22111	Louisiana	Union	2.29138E-05 TON	0107
22111	Louisiana	Union	4.93557E-06 TON	0802
22119	Louisiana	Webster	0.000325626 TON	0107
22119	Louisiana	Webster	0.000171035 TON	0107
22119	Louisiana	Webster	0.000171035 TON	0107
22119	Louisiana	Webster	1.90047E-05 TON	0107
22119	Louisiana	Webster	1.90047E-05 TON	0107
22119	Louisiana	Webster	1.90047E-05 TON	0107
22119	Louisiana	Webster	1.76969E-05 TON	0107
22119	Louisiana	Webster	1.76969E-05 TON	0107
22119	Louisiana	Webster	4.83363E-06 TON	0802
22123	Louisiana	W. Carroll	1.60986E-06 TON	0802
22127	Louisiana	Winn	9.95642E-05 TON	0107
22127	Louisiana	Winn	4.05399E-05 TON	0107
22127	Louisiana	Winn	4.05399E-05 TON	0107
22127	Louisiana	Winn	0.000107865 TON	0107
28001	Mississippi	Adams	0.00005637 TON	1626-2

28001	Mississippi	Adams	0.00010762 TON	1626-2
28001	Mississippi	Adams	0.00011787 TON	1626-2
28001	Mississippi	Adams	0.00010352 TON	1626-2
28001	Mississippi	Adams	0.00352492 TON	1626-2
28001	Mississippi	Adams	0.00352492 TON	1626-2
28001	Mississippi	Adams	0.00855563 TON	1626-2
28001	Mississippi	Adams	0.01163565 TON	1626-2
28001	Mississippi	Adams	0.00000472 TON	1626-2
28001	Mississippi	Adams	0.00000472 TON	1626-2
28001	Mississippi	Adams	0.00001145 TON	1626-2
28001	Mississippi	Adams	0.00001557 TON	1626-2
28001	Mississippi	Adams	0.000225112 TON	0107
28001	Mississippi	Adams	0.000517986 TON	0107
28001	Mississippi	Adams	0.00027 TON	0107
28001	Mississippi	Adams	0.00027 TON	0107
28001	Mississippi	Adams	0.00068 TON	0107
28001	Mississippi	Adams	0.00068 TON	0107
28001	Mississippi	Adams	7.05514E-06 TON	0802
28011	Mississippi	Bolivar	4.14111E-07 TON	0802
28011	Mississippi	Bolivar	4.14111E-07 TON	0802
28011	Mississippi	Bolivar	4.14111E-07 TON	0802
28027	Mississippi	Coahoma	0.00008 TON	1808-2
28053	Mississippi	Humphreys	4.14111E-07 TON	0802
28055	Mississippi	Issaquena	8.38445E-06 TON	0802
28055	Mississippi	Issaquena	1.51904E-08 TON	0802
28125	Mississippi	Sharkey	3.4938E-07 TON	0802
28133	Mississippi	Sunflower	3.79761E-07 TON	0802
28133	Mississippi	Sunflower	1.914E-06 TON	0802
28149	Mississippi	Warren	0.00012299 TON	1626-2
28149	Mississippi	Warren	0.01129343 TON	1626-2
28149	Mississippi	Warren	0.00001512 TON	1626-2
28149	Mississippi	Warren	0.000225112 TON	0107
28149	Mississippi	Warren	0.000715315 TON	0107
28149	Mississippi	Warren	5.14244E-05 TON	0107
28149	Mississippi	Warren	5.14244E-05 TON	0107
28149	Mississippi	Warren	5.14244E-05 TON	0107
28149	Mississippi	Warren	8.45781E-05 TON	0107
28149	Mississippi	Warren	8.45781E-05 TON	0107
28149	Mississippi	Warren	2.53436E-07 TON	0802
28149	Mississippi	Warren	1.74766E-06 TON	0802
28149	Mississippi	Warren	1.36549E-06 TON	0802
28151	Mississippi	Washington	0.02 TON	
28151	Mississippi	Washington	1.36703E-05 TON	0802
28151	Mississippi	Washington	4.14111E-07 TON	0802
48037	Texas	Bowie	3.39E-07 TON	0105
48037	Texas	Bowie	0.000147952 TON	0107
48037	Texas	Bowie	5.59E-08 TON	0105
48067	Texas	Cass	0.0005 TON	

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Table B.2 1999 Airshed Nonpoint Mercury Emissions from NEI.					
StateCount	State	County	Hg Emissions	Units	MACT Code
05001	Arkansas	Arkansas	8.7996E-06	TON	0107
05001	Arkansas	Arkansas	1.85056E-05	TON	0107
05001	Arkansas	Arkansas	1.35223E-05	TON	0107
05001	Arkansas	Arkansas	3.33607E-05	TON	0107
05001	Arkansas	Arkansas	1.89719E-06	TON	0107
05001	Arkansas	Arkansas	9.42144E-08	TON	
05001	Arkansas	Arkansas	5.54473E-06	TON	1807-2
05001	Arkansas	Arkansas	7.21739E-05	TON	
05001	Arkansas	Arkansas	6.83752E-09	TON	
05001	Arkansas	Arkansas	0.001069626	TON	
05001	Arkansas	Arkansas	6.83752E-05	TON	
05003	Arkansas	Ashley	1.3949E-05	TON	0107
05003	Arkansas	Ashley	2.93348E-05	TON	0107
05003	Arkansas	Ashley	2.14353E-05	TON	0107
05003	Arkansas	Ashley	2.67465E-05	TON	0107
05003	Arkansas	Ashley	1.52105E-06	TON	0107
05003	Arkansas	Ashley	1.04683E-07	TON	
05003	Arkansas	Ashley	6.5002E-06	TON	1807-2
05003	Arkansas	Ashley	8.4611E-05	TON	
05003	Arkansas	Ashley	2.50624E-07	TON	1640
05003	Arkansas	Ashley	8.01578E-09	TON	
05003	Arkansas	Ashley	8.01578E-05	TON	
05011	Arkansas	Bradley	3.55833E-06	TON	0107
05011	Arkansas	Bradley	7.4832E-06	TON	0107
05011	Arkansas	Bradley	5.46807E-06	TON	0107
05011	Arkansas	Bradley	1.4537E-05	TON	0107
05011	Arkansas	Bradley	8.26705E-07	TON	0107
05011	Arkansas	Bradley	3.05352E-06	TON	1807-2
05011	Arkansas	Bradley	1.43214E-08	TON	1640
05011	Arkansas	Bradley	3.76547E-09	TON	
05011	Arkansas	Bradley	3.76547E-05	TON	
05013	Arkansas	Calhoun	9.99431E-07	TON	0107
05013	Arkansas	Calhoun	2.10181E-06	TON	0107
05013	Arkansas	Calhoun	1.53582E-06	TON	0107
05013	Arkansas	Calhoun	4.34935E-06	TON	0107
05013	Arkansas	Calhoun	2.47343E-07	TON	0107
05013	Arkansas	Calhoun	1.57024E-08	TON	
05013	Arkansas	Calhoun	1.51405E-06	TON	1807-2
05013	Arkansas	Calhoun	1.97079E-05	TON	
05013	Arkansas	Calhoun	2.64945E-07	TON	1640
05013	Arkansas	Calhoun	1.86706E-09	TON	
05013	Arkansas	Calhoun	1.86706E-05	TON	
05017	Arkansas	Chicot	2.86619E-06	TON	0107
05017	Arkansas	Chicot	6.02762E-06	TON	0107
05017	Arkansas	Chicot	4.40446E-06	TON	0107
05017	Arkansas	Chicot	1.4631E-05	TON	0107
05017	Arkansas	Chicot	8.32053E-07	TON	0107
05017	Arkansas	Chicot	3.97661E-06	TON	1807-2
05017	Arkansas	Chicot	5.17623E-05	TON	

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05017	Arkansas	Chicot	4.9038E-09	TON	
05017	Arkansas	Chicot	4.9038E-05	TON	
05019	Arkansas	Clark	8.77089E-06	TON	0107
05019	Arkansas	Clark	1.84453E-05	TON	0107
05019	Arkansas	Clark	1.34782E-05	TON	0107
05019	Arkansas	Clark	3.30707E-05	TON	0107
05019	Arkansas	Clark	1.8807E-06	TON	0107
05019	Arkansas	Clark	4.71072E-08	TON	
05019	Arkansas	Clark	5.72833E-06	TON	1807-2
05019	Arkansas	Clark	1.43214E-08	TON	1640
05019	Arkansas	Clark	7.06393E-09	TON	
05019	Arkansas	Clark	0.000205282	TON	
05019	Arkansas	Clark	7.06393E-05	TON	
05023	Arkansas	Cleburne	4.15569E-06	TON	0107
05023	Arkansas	Cleburne	8.73945E-06	TON	0107
05023	Arkansas	Cleburne	6.38603E-06	TON	0107
05023	Arkansas	Cleburne	2.59472E-05	TON	0107
05023	Arkansas	Cleburne	1.47559E-06	TON	0107
05023	Arkansas	Cleburne	6.23497E-06	TON	1807-2
05023	Arkansas	Cleburne	7.68871E-09	TON	
05023	Arkansas	Cleburne	0.002690271	TON	
05023	Arkansas	Cleburne	7.68871E-05	TON	
05025	Arkansas	Cleveland	7.23728E-07	TON	0107
05025	Arkansas	Cleveland	1.52201E-06	TON	0107
05025	Arkansas	Cleveland	1.11215E-06	TON	0107
05025	Arkansas	Cleveland	4.02804E-06	TON	0107
05025	Arkansas	Cleveland	2.29071E-07	TON	0107
05025	Arkansas	Cleveland	1.57024E-08	TON	
05025	Arkansas	Cleveland	2.29047E-06	TON	1807-2
05025	Arkansas	Cleveland	2.82452E-09	TON	
05025	Arkansas	Cleveland	2.82452E-05	TON	
05027	Arkansas	Columbia	1.0158E-05	TON	0107
05027	Arkansas	Columbia	2.13624E-05	TON	0107
05027	Arkansas	Columbia	1.56098E-05	TON	0107
05027	Arkansas	Columbia	3.87915E-05	TON	0107
05027	Arkansas	Columbia	2.20603E-06	TON	0107
05027	Arkansas	Columbia	2.146E-07	TON	
05027	Arkansas	Columbia	6.60699E-06	TON	1807-2
05027	Arkansas	Columbia	8.60011E-05	TON	
05027	Arkansas	Columbia	1.0741E-06	TON	1640
05027	Arkansas	Columbia	8.14747E-09	TON	
05027	Arkansas	Columbia	8.14747E-05	TON	
05029	Arkansas	Conway	5.7611E-06	TON	0107
05029	Arkansas	Conway	1.21156E-05	TON	0107
05029	Arkansas	Conway	8.85306E-06	TON	0107
05029	Arkansas	Conway	2.78436E-05	TON	0107
05029	Arkansas	Conway	1.58344E-06	TON	0107
05029	Arkansas	Conway	1.5179E-07	TON	
05029	Arkansas	Conway	5.31429E-06	TON	1807-2
05029	Arkansas	Conway	6.91743E-05	TON	
05029	Arkansas	Conway	6.55336E-09	TON	

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05029	Arkansas	Conway	6.55336E-05	TON	
05039	Arkansas	Dallas	3.15625E-06	TON	0107
05039	Arkansas	Dallas	6.63763E-06	TON	0107
05039	Arkansas	Dallas	4.8502E-06	TON	0107
05039	Arkansas	Dallas	1.25465E-05	TON	0107
05039	Arkansas	Dallas	7.13506E-07	TON	0107
05039	Arkansas	Dallas	2.38736E-06	TON	1807-2
05039	Arkansas	Dallas	2.94399E-09	TON	
05039	Arkansas	Dallas	2.94399E-05	TON	
05041	Arkansas	Desha	4.58361E-06	TON	0107
05041	Arkansas	Desha	9.63936E-06	TON	0107
05041	Arkansas	Desha	7.04361E-06	TON	0107
05041	Arkansas	Desha	2.21464E-05	TON	0107
05041	Arkansas	Desha	1.25944E-06	TON	0107
05041	Arkansas	Desha	5.75755E-08	TON	
05041	Arkansas	Desha	3.97581E-06	TON	1807-2
05041	Arkansas	Desha	5.17518E-05	TON	
05041	Arkansas	Desha	1.43214E-08	TON	1640
05041	Arkansas	Desha	4.90281E-09	TON	
05041	Arkansas	Desha	4.90281E-05	TON	
05043	Arkansas	Drew	9.05233E-06	TON	0107
05043	Arkansas	Drew	1.90371E-05	TON	0107
05043	Arkansas	Drew	1.39107E-05	TON	0107
05043	Arkansas	Drew	3.59154E-05	TON	0107
05043	Arkansas	Drew	2.04247E-06	TON	0107
05043	Arkansas	Drew	4.67007E-06	TON	1807-2
05043	Arkansas	Drew	1.43214E-08	TON	1640
05043	Arkansas	Drew	5.75894E-09	TON	
05043	Arkansas	Drew	5.75894E-05	TON	
05045	Arkansas	Faulkner	2.2493E-05	TON	0107
05045	Arkansas	Faulkner	4.73029E-05	TON	0107
05045	Arkansas	Faulkner	3.45649E-05	TON	0107
05045	Arkansas	Faulkner	0.000145339	TON	0107
05045	Arkansas	Faulkner	8.26527E-06	TON	0107
05045	Arkansas	Faulkner	5.07711E-07	TON	
05045	Arkansas	Faulkner	2.14204E-05	TON	1807-2
05045	Arkansas	Faulkner	0.000278822	TON	
05045	Arkansas	Faulkner	1.00249E-07	TON	1640
05045	Arkansas	Faulkner	2.64148E-08	TON	
05045	Arkansas	Faulkner	0.000205282	TON	
05045	Arkansas	Faulkner	0.000264148	TON	
05047	Arkansas	Franklin	4.1643E-06	TON	0107
05047	Arkansas	Franklin	8.75756E-06	TON	0107
05047	Arkansas	Franklin	6.39926E-06	TON	0107
05047	Arkansas	Franklin	1.40276E-05	TON	0107
05047	Arkansas	Franklin	7.97737E-07	TON	0107
05047	Arkansas	Franklin	5.23414E-08	TON	
05047	Arkansas	Franklin	4.49664E-06	TON	1807-2
05047	Arkansas	Franklin	1.43214E-08	TON	1640
05047	Arkansas	Franklin	5.54507E-09	TON	
05047	Arkansas	Franklin	5.54507E-05	TON	

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05051	Arkansas	Garland	1.14303E-05	TON	0107
05051	Arkansas	Garland	2.4038E-05	TON	0107
05051	Arkansas	Garland	1.75649E-05	TON	0107
05051	Arkansas	Garland	0.000180705	TON	0107
05051	Arkansas	Garland	1.02765E-05	TON	0107
05051	Arkansas	Garland	4.76306E-07	TON	
05051	Arkansas	Garland	2.2609E-05	TON	1807-2
05051	Arkansas	Garland	0.000294294	TON	
05051	Arkansas	Garland	1.43214E-08	TON	1640
05051	Arkansas	Garland	2.78805E-08	TON	
05051	Arkansas	Garland	0.000205282	TON	
05051	Arkansas	Garland	0.000278805	TON	
05053	Arkansas	Grant	4.89952E-06	TON	0107
05053	Arkansas	Grant	1.03037E-05	TON	0107
05053	Arkansas	Grant	7.52906E-06	TON	0107
05053	Arkansas	Grant	1.03366E-05	TON	0107
05053	Arkansas	Grant	5.87829E-07	TON	0107
05053	Arkansas	Grant	4.27798E-06	TON	1807-2
05053	Arkansas	Grant	2.86427E-08	TON	1640
05053	Arkansas	Grant	5.27543E-09	TON	
05053	Arkansas	Grant	0.000205282	TON	
05053	Arkansas	Grant	5.27543E-05	TON	
05057	Arkansas	Hempstead	1.0494E-05	TON	0107
05057	Arkansas	Hempstead	2.20691E-05	TON	0107
05057	Arkansas	Hempstead	1.61262E-05	TON	0107
05057	Arkansas	Hempstead	2.83844E-05	TON	0107
05057	Arkansas	Hempstead	1.61419E-06	TON	0107
05057	Arkansas	Hempstead	1.83195E-07	TON	
05057	Arkansas	Hempstead	5.913E-06	TON	1807-2
05057	Arkansas	Hempstead	7.69676E-05	TON	
05057	Arkansas	Hempstead	1.71856E-07	TON	1640
05057	Arkansas	Hempstead	7.29166E-09	TON	
05057	Arkansas	Hempstead	7.29166E-05	TON	
05059	Arkansas	Hot Spring	6.37569E-06	TON	0107
05059	Arkansas	Hot Spring	1.34081E-05	TON	0107
05059	Arkansas	Hot Spring	9.7975E-06	TON	0107
05059	Arkansas	Hot Spring	2.72794E-05	TON	0107
05059	Arkansas	Hot Spring	1.55135E-06	TON	0107
05059	Arkansas	Hot Spring	1.41322E-07	TON	
05059	Arkansas	Hot Spring	7.80281E-06	TON	1807-2
05059	Arkansas	Hot Spring	8.59281E-08	TON	1640
05059	Arkansas	Hot Spring	9.62211E-09	TON	
05059	Arkansas	Hot Spring	0.000205282	TON	
05059	Arkansas	Hot Spring	9.62211E-05	TON	
05061	Arkansas	Howard	1.47129E-05	TON	0107
05061	Arkansas	Howard	3.09414E-05	TON	0107
05061	Arkansas	Howard	2.26093E-05	TON	0107
05061	Arkansas	Howard	1.54931E-05	TON	0107
05061	Arkansas	Howard	8.81076E-07	TON	0107
05061	Arkansas	Howard	1.04683E-08	TON	
05061	Arkansas	Howard	3.6616E-06	TON	1807-2

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05061	Arkansas	Howard	4.76619E-05	TON	
05061	Arkansas	Howard	4.51533E-09	TON	
05061	Arkansas	Howard	4.51533E-05	TON	
05069	Arkansas	Jefferson	2.32713E-05	TON	0107
05069	Arkansas	Jefferson	4.89397E-05	TON	0107
05069	Arkansas	Jefferson	3.57609E-05	TON	0107
05069	Arkansas	Jefferson	0.000137761	TON	0107
05069	Arkansas	Jefferson	7.83431E-06	TON	0107
05069	Arkansas	Jefferson	9.94486E-08	TON	
05069	Arkansas	Jefferson	2.16214E-05	TON	1807-2
05069	Arkansas	Jefferson	0.000281439	TON	
05069	Arkansas	Jefferson	2.66626E-08	TON	
05069	Arkansas	Jefferson	0.000205282	TON	
05069	Arkansas	Jefferson	0.000266626	TON	
05071	Arkansas	Johnson	9.09542E-06	TON	0107
05071	Arkansas	Johnson	1.91277E-05	TON	0107
05071	Arkansas	Johnson	1.39769E-05	TON	0107
05071	Arkansas	Johnson	2.52105E-05	TON	0107
05071	Arkansas	Johnson	1.4337E-06	TON	0107
05071	Arkansas	Johnson	5.23414E-08	TON	
05071	Arkansas	Johnson	5.71628E-06	TON	1807-2
05071	Arkansas	Johnson	7.04908E-09	TON	
05071	Arkansas	Johnson	7.04908E-05	TON	
05073	Arkansas	Lafayette	1.63126E-06	TON	0107
05073	Arkansas	Lafayette	3.43055E-06	TON	0107
05073	Arkansas	Lafayette	2.50675E-06	TON	0107
05073	Arkansas	Lafayette	6.34769E-06	TON	0107
05073	Arkansas	Lafayette	3.60987E-07	TON	0107
05073	Arkansas	Lafayette	2.36756E-06	TON	1807-2
05073	Arkansas	Lafayette	3.08177E-05	TON	
05073	Arkansas	Lafayette	2.91957E-09	TON	
05073	Arkansas	Lafayette	2.91957E-05	TON	
05079	Arkansas	Lincoln	2.61346E-06	TON	0107
05079	Arkansas	Lincoln	5.49613E-06	TON	0107
05079	Arkansas	Lincoln	4.01609E-06	TON	0107
05079	Arkansas	Lincoln	6.64549E-06	TON	0107
05079	Arkansas	Lincoln	3.77922E-07	TON	0107
05079	Arkansas	Lincoln	1.04683E-08	TON	
05079	Arkansas	Lincoln	3.84654E-06	TON	1807-2
05079	Arkansas	Lincoln	4.74339E-09	TON	
05079	Arkansas	Lincoln	4.74339E-05	TON	
05081	Arkansas	Little River	4.80762E-06	TON	0107
05081	Arkansas	Little River	1.01105E-05	TON	0107
05081	Arkansas	Little River	7.38784E-06	TON	0107
05081	Arkansas	Little River	1.12221E-05	TON	0107
05081	Arkansas	Little River	6.38189E-07	TON	0107
05081	Arkansas	Little River	3.49673E-06	TON	1807-2
05081	Arkansas	Little River	4.55158E-05	TON	
05081	Arkansas	Little River	2.86427E-08	TON	1640
05081	Arkansas	Little River	4.31203E-09	TON	
05081	Arkansas	Little River	4.31203E-05	TON	

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05083	Arkansas	Logan	7.64222E-06	TON	0107
05083	Arkansas	Logan	1.60716E-05	TON	0107
05083	Arkansas	Logan	1.17438E-05	TON	0107
05083	Arkansas	Logan	1.94114E-05	TON	0107
05083	Arkansas	Logan	1.10391E-06	TON	0107
05083	Arkansas	Logan	2.61707E-08	TON	
05083	Arkansas	Logan	5.65633E-06	TON	1807-2
05083	Arkansas	Logan	7.36266E-05	TON	
05083	Arkansas	Logan	8.59281E-08	TON	1640
05083	Arkansas	Logan	6.97515E-09	TON	
05083	Arkansas	Logan	6.97515E-05	TON	
05085	Arkansas	Lonoke	6.29815E-06	TON	0107
05085	Arkansas	Lonoke	1.32451E-05	TON	0107
05085	Arkansas	Lonoke	9.67834E-06	TON	0107
05085	Arkansas	Lonoke	4.76234E-05	TON	0107
05085	Arkansas	Lonoke	2.70829E-06	TON	0107
05085	Arkansas	Lonoke	4.92009E-07	TON	
05085	Arkansas	Lonoke	1.37693E-05	TON	1807-2
05085	Arkansas	Lonoke	8.59281E-08	TON	1640
05085	Arkansas	Lonoke	1.69798E-08	TON	
05085	Arkansas	Lonoke	0.000169798	TON	
05091	Arkansas	Miller	7.08506E-06	TON	0107
05091	Arkansas	Miller	1.48999E-05	TON	0107
05091	Arkansas	Miller	1.08876E-05	TON	0107
05091	Arkansas	Miller	5.56324E-05	TON	0107
05091	Arkansas	Miller	3.16376E-06	TON	0107
05091	Arkansas	Miller	1.09917E-07	TON	
05091	Arkansas	Miller	1.05389E-05	TON	1807-2
05091	Arkansas	Miller	8.59281E-08	TON	1640
05091	Arkansas	Miller	1.29961E-08	TON	
05091	Arkansas	Miller	0.000129961	TON	
05095	Arkansas	Monroe	1.55372E-06	TON	0107
05095	Arkansas	Monroe	3.26748E-06	TON	0107
05095	Arkansas	Monroe	2.38759E-06	TON	0107
05095	Arkansas	Monroe	1.26484E-05	TON	0107
05095	Arkansas	Monroe	7.193E-07	TON	0107
05095	Arkansas	Monroe	6.28096E-08	TON	
05095	Arkansas	Monroe	2.67374E-06	TON	1807-2
05095	Arkansas	Monroe	3.29714E-09	TON	
05095	Arkansas	Monroe	3.29714E-05	TON	
05097	Arkansas	Montgomery	1.02241E-06	TON	0107
05097	Arkansas	Montgomery	2.15014E-06	TON	0107
05097	Arkansas	Montgomery	1.57113E-06	TON	0107
05097	Arkansas	Montgomery	5.41513E-06	TON	0107
05097	Arkansas	Montgomery	3.07953E-07	TON	0107
05097	Arkansas	Montgomery	3.6639E-08	TON	
05097	Arkansas	Montgomery	2.33919E-06	TON	1807-2
05097	Arkansas	Montgomery	2.88459E-09	TON	
05097	Arkansas	Montgomery	2.88459E-05	TON	
05099	Arkansas	Nevada	1.91558E-06	TON	0107
05099	Arkansas	Nevada	4.02848E-06	TON	0107

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05099	Arkansas	Nevada	2.94366E-06	TON	0107
05099	Arkansas	Nevada	8.38522E-06	TON	0107
05099	Arkansas	Nevada	4.76859E-07	TON	0107
05099	Arkansas	Nevada	1.57024E-08	TON	
05099	Arkansas	Nevada	2.68284E-06	TON	1807-2
05099	Arkansas	Nevada	3.49216E-05	TON	
05099	Arkansas	Nevada	3.30836E-09	TON	
05099	Arkansas	Nevada	3.30836E-05	TON	
05101	Arkansas	Newton	5.31308E-07	TON	0107
05101	Arkansas	Newton	1.11734E-06	TON	0107
05101	Arkansas	Newton	8.16458E-07	TON	0107
05101	Arkansas	Newton	4.99979E-06	TON	0107
05101	Arkansas	Newton	2.84333E-07	TON	0107
05101	Arkansas	Newton	4.71072E-08	TON	
05101	Arkansas	Newton	2.20162E-06	TON	1807-2
05101	Arkansas	Newton	2.71494E-09	TON	
05101	Arkansas	Newton	0.000205282	TON	
05101	Arkansas	Newton	2.71494E-05	TON	
05103	Arkansas	Ouachita	9.8852E-06	TON	0107
05103	Arkansas	Ouachita	2.07887E-05	TON	0107
05103	Arkansas	Ouachita	1.51905E-05	TON	0107
05103	Arkansas	Ouachita	3.39562E-05	TON	0107
05103	Arkansas	Ouachita	1.93106E-06	TON	0107
05103	Arkansas	Ouachita	9.94486E-08	TON	
05103	Arkansas	Ouachita	7.35666E-06	TON	1807-2
05103	Arkansas	Ouachita	9.57592E-05	TON	
05103	Arkansas	Ouachita	8.59281E-08	TON	1640
05103	Arkansas	Ouachita	9.07192E-09	TON	
05103	Arkansas	Ouachita	9.07192E-05	TON	
05105	Arkansas	Perry	5.83003E-07	TON	0107
05105	Arkansas	Perry	1.22606E-06	TON	0107
05105	Arkansas	Perry	8.95897E-07	TON	0107
05105	Arkansas	Perry	6.99814E-06	TON	0107
05105	Arkansas	Perry	3.97977E-07	TON	0107
05105	Arkansas	Perry	3.14048E-08	TON	
05105	Arkansas	Perry	2.59023E-06	TON	1807-2
05105	Arkansas	Perry	3.19417E-09	TON	
05105	Arkansas	Perry	3.19417E-05	TON	
05107	Arkansas	Phillips	3.40898E-06	TON	0107
05107	Arkansas	Phillips	7.16912E-06	TON	0107
05107	Arkansas	Phillips	5.23857E-06	TON	0107
05107	Arkansas	Phillips	3.27651E-05	TON	0107
05107	Arkansas	Phillips	1.86332E-06	TON	0107
05107	Arkansas	Phillips	4.18731E-08	TON	
05107	Arkansas	Phillips	7.23943E-06	TON	1807-2
05107	Arkansas	Phillips	9.42333E-05	TON	
05107	Arkansas	Phillips	6.22979E-07	TON	1640
05107	Arkansas	Phillips	8.92736E-09	TON	
05107	Arkansas	Phillips	8.92736E-05	TON	
05109	Arkansas	Pike	1.86963E-06	TON	0107
05109	Arkansas	Pike	3.93184E-06	TON	0107

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05109	Arkansas	Pike	2.87305E-06	TON	0107
05109	Arkansas	Pike	1.25387E-05	TON	0107
05109	Arkansas	Pike	7.13061E-07	TON	0107
05109	Arkansas	Pike	2.79712E-06	TON	1807-2
05109	Arkansas	Pike	3.64092E-05	TON	
05109	Arkansas	Pike	3.44929E-09	TON	
05109	Arkansas	Pike	3.44929E-05	TON	
05113	Arkansas	Polk	6.64565E-06	TON	0107
05113	Arkansas	Polk	1.39759E-05	TON	0107
05113	Arkansas	Polk	1.02123E-05	TON	0107
05113	Arkansas	Polk	2.17154E-05	TON	0107
05113	Arkansas	Polk	1.23493E-06	TON	0107
05113	Arkansas	Polk	1.30853E-07	TON	
05113	Arkansas	Polk	5.24764E-06	TON	1807-2
05113	Arkansas	Polk	6.83068E-05	TON	
05113	Arkansas	Polk	1.43214E-08	TON	1640
05113	Arkansas	Polk	6.47118E-09	TON	
05113	Arkansas	Polk	6.47118E-05	TON	
05115	Arkansas	Pope	2.29094E-05	TON	0107
05115	Arkansas	Pope	4.81787E-05	TON	0107
05115	Arkansas	Pope	3.52048E-05	TON	0107
05115	Arkansas	Pope	0.000105583	TON	0107
05115	Arkansas	Pope	6.00442E-06	TON	0107
05115	Arkansas	Pope	2.09365E-07	TON	
05115	Arkansas	Pope	1.40774E-05	TON	1807-2
05115	Arkansas	Pope	0.000183241	TON	
05115	Arkansas	Pope	8.59281E-08	TON	1640
05115	Arkansas	Pope	1.73597E-08	TON	
05115	Arkansas	Pope	0.000205282	TON	
05115	Arkansas	Pope	0.000173597	TON	
05117	Arkansas	Prairie	7.78296E-07	TON	0107
05117	Arkansas	Prairie	1.63676E-06	TON	0107
05117	Arkansas	Prairie	1.196E-06	TON	0107
05117	Arkansas	Prairie	7.28809E-06	TON	0107
05117	Arkansas	Prairie	4.14467E-07	TON	0107
05117	Arkansas	Prairie	1.04683E-07	TON	
05117	Arkansas	Prairie	2.48478E-06	TON	1807-2
05117	Arkansas	Prairie	3.23436E-05	TON	
05117	Arkansas	Prairie	3.06413E-09	TON	
05117	Arkansas	Prairie	3.06413E-05	TON	
05119	Arkansas	Pulaski	7.26944E-05	TON	0107
05119	Arkansas	Pulaski	0.000152877	TON	0107
05119	Arkansas	Pulaski	0.000111709	TON	0107
05119	Arkansas	Pulaski	0.001286928	TON	0107
05119	Arkansas	Pulaski	7.31863E-05	TON	0107
05119	Arkansas	Pulaski	6.17628E-07	TON	
05119	Arkansas	Pulaski	9.34689E-05	TON	1807-2
05119	Arkansas	Pulaski	0.001216654	TON	
05119	Arkansas	Pulaski	3.96272E-06	TON	1640
05119	Arkansas	Pulaski	1.15262E-07	TON	
05119	Arkansas	Pulaski	0.001069626	TON	

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05119	Arkansas	Pulaski	0.00115262	TON	
05125	Arkansas	Saline	6.75479E-06	TON	0107
05125	Arkansas	Saline	1.42054E-05	TON	0107
05125	Arkansas	Saline	1.03801E-05	TON	0107
05125	Arkansas	Saline	8.70574E-05	TON	0107
05125	Arkansas	Saline	4.95087E-06	TON	0107
05125	Arkansas	Saline	2.87877E-07	TON	
05125	Arkansas	Saline	2.09726E-05	TON	1807-2
05125	Arkansas	Saline	0.000272994	TON	
05125	Arkansas	Saline	8.59281E-08	TON	1640
05125	Arkansas	Saline	2.58626E-08	TON	
05125	Arkansas	Saline	6.48258E-05	TON	
05125	Arkansas	Saline	0.000258626	TON	
05127	Arkansas	Scott	5.02876E-06	TON	0107
05127	Arkansas	Scott	1.05755E-05	TON	0107
05127	Arkansas	Scott	7.72767E-06	TON	0107
05127	Arkansas	Scott	8.19714E-06	TON	0107
05127	Arkansas	Scott	4.66163E-07	TON	0107
05127	Arkansas	Scott	6.80438E-08	TON	
05127	Arkansas	Scott	2.84877E-06	TON	1807-2
05127	Arkansas	Scott	3.70816E-05	TON	
05127	Arkansas	Scott	1.43214E-08	TON	1640
05127	Arkansas	Scott	3.51299E-09	TON	
05127	Arkansas	Scott	3.51299E-05	TON	
05129	Arkansas	Searcy	1.12293E-06	TON	0107
05129	Arkansas	Searcy	2.36153E-06	TON	0107
05129	Arkansas	Searcy	1.7256E-06	TON	0107
05129	Arkansas	Searcy	8.84759E-06	TON	0107
05129	Arkansas	Searcy	5.03153E-07	TON	0107
05129	Arkansas	Searcy	4.71072E-08	TON	
05129	Arkansas	Searcy	2.08519E-06	TON	1807-2
05129	Arkansas	Searcy	2.57137E-09	TON	
05129	Arkansas	Searcy	2.57137E-05	TON	
05131	Arkansas	Sebastian	7.21947E-05	TON	0107
05131	Arkansas	Sebastian	0.000151826	TON	0107
05131	Arkansas	Sebastian	0.000110941	TON	0107
05131	Arkansas	Sebastian	0.000311068	TON	0107
05131	Arkansas	Sebastian	1.76901E-05	TON	0107
05131	Arkansas	Sebastian	2.77409E-07	TON	
05131	Arkansas	Sebastian	2.84374E-05	TON	1807-2
05131	Arkansas	Sebastian	0.000370161	TON	
05131	Arkansas	Sebastian	1.86178E-07	TON	1640
05131	Arkansas	Sebastian	3.50678E-08	TON	
05131	Arkansas	Sebastian	0.000205282	TON	
05131	Arkansas	Sebastian	0.000350678	TON	
05133	Arkansas	Sevier	6.95295E-06	TON	0107
05133	Arkansas	Sevier	1.46221E-05	TON	0107
05133	Arkansas	Sevier	1.06846E-05	TON	0107
05133	Arkansas	Sevier	2.10649E-05	TON	0107
05133	Arkansas	Sevier	1.19794E-06	TON	0107
05133	Arkansas	Sevier	5.23414E-09	TON	

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05133	Arkansas	Sevier	3.92657E-06	TON	1807-2
05133	Arkansas	Sevier	5.11108E-05	TON	
05133	Arkansas	Sevier	4.84208E-09	TON	
05133	Arkansas	Sevier	4.84208E-05	TON	
05139	Arkansas	Union	1.77916E-05	TON	0107
05139	Arkansas	Union	3.7416E-05	TON	0107
05139	Arkansas	Union	2.73403E-05	TON	0107
05139	Arkansas	Union	7.60939E-05	TON	0107
05139	Arkansas	Union	4.32739E-06	TON	0107
05139	Arkansas	Union	1.83195E-07	TON	
05139	Arkansas	Union	1.2035E-05	TON	1807-2
05139	Arkansas	Union	0.000156656	TON	
05139	Arkansas	Union	1.41065E-06	TON	1640
05139	Arkansas	Union	1.48411E-08	TON	
05139	Arkansas	Union	0.000148411	TON	
05141	Arkansas	Van Buren	2.31478E-06	TON	0107
05141	Arkansas	Van Buren	4.868E-06	TON	0107
05141	Arkansas	Van Buren	3.55711E-06	TON	0107
05141	Arkansas	Van Buren	1.46624E-05	TON	0107
05141	Arkansas	Van Buren	8.33835E-07	TON	0107
05141	Arkansas	Van Buren	1.67492E-07	TON	
05141	Arkansas	Van Buren	4.19581E-06	TON	1807-2
05141	Arkansas	Van Buren	5.46155E-05	TON	
05141	Arkansas	Van Buren	5.1741E-09	TON	
05141	Arkansas	Van Buren	5.1741E-05	TON	
05145	Arkansas	White	1.40983E-05	TON	0107
05145	Arkansas	White	2.96489E-05	TON	0107
05145	Arkansas	White	2.16648E-05	TON	0107
05145	Arkansas	White	0.000105137	TON	0107
05145	Arkansas	White	5.97901E-06	TON	0107
05145	Arkansas	White	2.4077E-07	TON	
05145	Arkansas	White	1.74184E-05	TON	1807-2
05145	Arkansas	White	0.000226729	TON	
05145	Arkansas	White	2.14796E-08	TON	
05145	Arkansas	White	0.000205282	TON	
05145	Arkansas	White	0.000214796	TON	
05147	Arkansas	Woodruff	3.14477E-06	TON	0107
05147	Arkansas	Woodruff	6.61347E-06	TON	0107
05147	Arkansas	Woodruff	4.83255E-06	TON	0107
05147	Arkansas	Woodruff	6.71602E-06	TON	0107
05147	Arkansas	Woodruff	3.81933E-07	TON	0107
05147	Arkansas	Woodruff	2.33116E-06	TON	1807-2
05147	Arkansas	Woodruff	2.87468E-09	TON	
05147	Arkansas	Woodruff	2.87468E-05	TON	
05149	Arkansas	Yell	9.00064E-06	TON	0107
05149	Arkansas	Yell	1.89284E-05	TON	0107
05149	Arkansas	Yell	1.38312E-05	TON	0107
05149	Arkansas	Yell	2.54378E-05	TON	0107
05149	Arkansas	Yell	1.44662E-06	TON	0107
05149	Arkansas	Yell	4.71072E-08	TON	
05149	Arkansas	Yell	5.04584E-06	TON	1807-2

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05149	Arkansas	Yell	6.56801E-05	TON	
05149	Arkansas	Yell	6.22232E-09	TON	
05149	Arkansas	Yell	6.22232E-05	TON	
22009	Louisiana	Avoyelles	2.48E-06	TON	107
22009	Louisiana	Avoyelles	5.21E-06	TON	107
22009	Louisiana	Avoyelles	3.80E-06	TON	107
22009	Louisiana	Avoyelles	5.34E-05	TON	107
22009	Louisiana	Avoyelles	3.04E-06	TON	107
22009	Louisiana	Avoyelles	1.95E-07	TON	
22009	Louisiana	Avoyelles	6.61E-06	TON	1807-2
22009	Louisiana	Avoyelles	0.000141825	TON	
22009	Louisiana	Avoyelles	1.34E-08	TON	
22009	Louisiana	Avoyelles	0.000134361	TON	
22013	Louisiana	Bienville	5.20E-06	TON	107
22013	Louisiana	Bienville	1.09E-05	TON	107
22013	Louisiana	Bienville	7.99E-06	TON	107
22013	Louisiana	Bienville	1.24E-05	TON	107
22013	Louisiana	Bienville	7.03E-07	TON	107
22013	Louisiana	Bienville	5.95E-08	TON	
22013	Louisiana	Bienville	2.56E-06	TON	1807-2
22013	Louisiana	Bienville	5.19E-09	TON	
22013	Louisiana	Bienville	5.19E-05	TON	
22015	Louisiana	Bossier	7.96E-06	TON	107
22015	Louisiana	Bossier	1.67E-05	TON	107
22015	Louisiana	Bossier	1.22E-05	TON	107
22015	Louisiana	Bossier	0.000192931	TON	107
22015	Louisiana	Bossier	1.10E-05	TON	107
22015	Louisiana	Bossier	1.78E-07	TON	
22015	Louisiana	Bossier	1.52E-05	TON	1807-2
22015	Louisiana	Bossier	0.000325296	TON	
22015	Louisiana	Bossier	1.43E-08	TON	1640
22015	Louisiana	Bossier	3.08E-08	TON	
22015	Louisiana	Bossier	0.001069626	TON	
22015	Louisiana	Bossier	0.000308175	TON	
22017	Louisiana	Caddo	4.88E-05	TON	107
22017	Louisiana	Caddo	0.000102621	TON	107
22017	Louisiana	Caddo	7.50E-05	TON	107
22017	Louisiana	Caddo	0.000625373	TON	107
22017	Louisiana	Caddo	3.56E-05	TON	107
22017	Louisiana	Caddo	2.49E-07	TON	
22017	Louisiana	Caddo	3.92E-05	TON	1807-2
22017	Louisiana	Caddo	0.000841344	TON	
22017	Louisiana	Caddo	7.97E-08	TON	
22017	Louisiana	Caddo	0.001447777	TON	
22017	Louisiana	Caddo	0.000797063	TON	
22021	Louisiana	Caldwell	6.49E-07	TON	107
22021	Louisiana	Caldwell	1.36E-06	TON	107
22021	Louisiana	Caldwell	9.97E-07	TON	107
22021	Louisiana	Caldwell	1.08E-05	TON	107
22021	Louisiana	Caldwell	6.15E-07	TON	107
22021	Louisiana	Caldwell	1.70E-06	TON	1807-2

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22021	Louisiana	Caldwell	3.65E-05	TON	
22021	Louisiana	Caldwell	3.46E-09	TON	
22021	Louisiana	Caldwell	3.46E-05	TON	
22025	Louisiana	Catahoula	1.26E-06	TON	107
22025	Louisiana	Catahoula	2.65E-06	TON	107
22025	Louisiana	Catahoula	1.94E-06	TON	107
22025	Louisiana	Catahoula	1.13E-05	TON	107
22025	Louisiana	Catahoula	6.41E-07	TON	107
22025	Louisiana	Catahoula	1.51E-07	TON	
22025	Louisiana	Catahoula	1.77E-06	TON	1807-2
22025	Louisiana	Catahoula	3.60E-09	TON	
22025	Louisiana	Catahoula	3.60E-05	TON	
22027	Louisiana	Claiborn	1.98E-06	TON	107
22027	Louisiana	Claiborn	4.17E-06	TON	107
22027	Louisiana	Claiborn	3.05E-06	TON	107
22027	Louisiana	Claiborn	1.50E-05	TON	107
22027	Louisiana	Claiborn	8.52E-07	TON	107
22027	Louisiana	Claiborn	2.73E-06	TON	1807-2
22027	Louisiana	Claiborn	5.86E-05	TON	
22027	Louisiana	Claiborn	1.43E-08	TON	1640
22027	Louisiana	Claiborn	5.55E-09	TON	
22027	Louisiana	Claiborn	5.55E-05	TON	
22029	Louisiana	Concordia	1.39E-06	TON	107
22029	Louisiana	Concordia	2.93E-06	TON	107
22029	Louisiana	Concordia	2.14E-06	TON	107
22029	Louisiana	Concordia	2.43E-05	TON	107
22029	Louisiana	Concordia	1.38E-06	TON	107
22029	Louisiana	Concordia	2.16E-07	TON	
22029	Louisiana	Concordia	3.34E-06	TON	1807-2
22029	Louisiana	Concordia	6.79E-09	TON	
22029	Louisiana	Concordia	0.000205282	TON	
22029	Louisiana	Concordia	6.79E-05	TON	
22035	Louisiana	E. Carroll	2.33E-07	TON	107
22035	Louisiana	E. Carroll	4.89E-07	TON	107
22035	Louisiana	E. Carroll	3.57E-07	TON	107
22035	Louisiana	E. Carroll	6.97E-06	TON	107
22035	Louisiana	E. Carroll	3.97E-07	TON	107
22035	Louisiana	E. Carroll	1.62E-07	TON	
22035	Louisiana	E. Carroll	1.42E-06	TON	1807-2
22035	Louisiana	E. Carroll	2.88E-09	TON	
22035	Louisiana	E. Carroll	2.88E-05	TON	
22041	Louisiana	Franklin	2.18E-06	TON	107
22041	Louisiana	Franklin	4.58E-06	TON	107
22041	Louisiana	Franklin	3.35E-06	TON	107
22041	Louisiana	Franklin	2.91E-05	TON	107
22041	Louisiana	Franklin	1.65E-06	TON	107
22041	Louisiana	Franklin	3.62E-07	TON	
22041	Louisiana	Franklin	3.57E-06	TON	1807-2
22041	Louisiana	Franklin	8.59E-08	TON	1640
22041	Louisiana	Franklin	7.26E-09	TON	
22041	Louisiana	Franklin	7.26E-05	TON	

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22043	Louisiana	Grant	1.97E-06	TON	107
22043	Louisiana	Grant	4.14E-06	TON	107
22043	Louisiana	Grant	3.02E-06	TON	107
22043	Louisiana	Grant	7.41E-06	TON	107
22043	Louisiana	Grant	4.21E-07	TON	107
22043	Louisiana	Grant	2.43E-07	TON	
22043	Louisiana	Grant	3.12E-06	TON	1807-2
22043	Louisiana	Grant	8.59E-08	TON	1640
22043	Louisiana	Grant	6.34E-09	TON	
22043	Louisiana	Grant	0.000205282	TON	
22043	Louisiana	Grant	6.34E-05	TON	
22049	Louisiana	Jackson	3.60E-06	TON	107
22049	Louisiana	Jackson	7.56E-06	TON	107
22049	Louisiana	Jackson	5.53E-06	TON	107
22049	Louisiana	Jackson	1.48E-05	TON	107
22049	Louisiana	Jackson	8.44E-07	TON	107
22049	Louisiana	Jackson	8.11E-08	TON	
22049	Louisiana	Jackson	2.51E-06	TON	1807-2
22049	Louisiana	Jackson	1.43E-08	TON	1640
22049	Louisiana	Jackson	5.10E-09	TON	
22049	Louisiana	Jackson	5.10E-05	TON	
22059	Louisiana	La Salle	3.71E-06	TON	107
22059	Louisiana	La Salle	7.80E-06	TON	107
22059	Louisiana	La Salle	5.70E-06	TON	107
22059	Louisiana	La Salle	1.52E-05	TON	107
22059	Louisiana	La Salle	8.65E-07	TON	107
22059	Louisiana	La Salle	1.95E-07	TON	
22059	Louisiana	La Salle	2.22E-06	TON	1807-2
22059	Louisiana	La Salle	4.77E-05	TON	
22059	Louisiana	La Salle	4.52E-09	TON	
22059	Louisiana	La Salle	4.52E-05	TON	
22061	Louisiana	Lincoln	6.25E-06	TON	107
22061	Louisiana	Lincoln	1.31E-05	TON	107
22061	Louisiana	Lincoln	9.61E-06	TON	107
22061	Louisiana	Lincoln	7.45E-05	TON	107
22061	Louisiana	Lincoln	4.24E-06	TON	107
22061	Louisiana	Lincoln	8.65E-08	TON	
22061	Louisiana	Lincoln	6.68E-06	TON	1807-2
22061	Louisiana	Lincoln	0.000143285	TON	
22061	Louisiana	Lincoln	1.43E-08	TON	1640
22061	Louisiana	Lincoln	1.36E-08	TON	
22061	Louisiana	Lincoln	0.000135744	TON	
22065	Louisiana	Madison	6.72E-07	TON	107
22065	Louisiana	Madison	1.41E-06	TON	107
22065	Louisiana	Madison	1.03E-06	TON	107
22065	Louisiana	Madison	1.84E-05	TON	107
22065	Louisiana	Madison	1.05E-06	TON	107
22065	Louisiana	Madison	7.57E-08	TON	
22065	Louisiana	Madison	2.11E-06	TON	1807-2
22065	Louisiana	Madison	8.59E-08	TON	1640
22065	Louisiana	Madison	4.29E-09	TON	

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22065	Louisiana	Madison	4.29E-05	TON	
22067	Louisiana	Morehouse	5.22E-06	TON	107
22067	Louisiana	Morehouse	1.10E-05	TON	107
22067	Louisiana	Morehouse	8.01E-06	TON	107
22067	Louisiana	Morehouse	3.07E-05	TON	107
22067	Louisiana	Morehouse	1.75E-06	TON	107
22067	Louisiana	Morehouse	3.89E-07	TON	
22067	Louisiana	Morehouse	5.07E-06	TON	1807-2
22067	Louisiana	Morehouse	1.43E-08	TON	1640
22067	Louisiana	Morehouse	1.03E-08	TON	
22067	Louisiana	Morehouse	0.000103112	TON	
22069	Louisiana	Natchitoches	6.00E-06	TON	107
22069	Louisiana	Natchitoches	1.26E-05	TON	107
22069	Louisiana	Natchitoches	9.22E-06	TON	107
22069	Louisiana	Natchitoches	4.94E-05	TON	107
22069	Louisiana	Natchitoches	2.81E-06	TON	107
22069	Louisiana	Natchitoches	2.00E-07	TON	
22069	Louisiana	Natchitoches	6.04E-06	TON	1807-2
22069	Louisiana	Natchitoches	1.23E-08	TON	
22069	Louisiana	Natchitoches	0.00012277	TON	
22073	Louisiana	Ouachita	2.75E-05	TON	107
22073	Louisiana	Ouachita	4.22E-05	TON	107
22073	Louisiana	Ouachita	0.00036529	TON	107
22073	Louisiana	Ouachita	2.08E-05	TON	107
22073	Louisiana	Ouachita	4.54E-07	TON	
22073	Louisiana	Ouachita	2.38E-05	TON	1807-2
22073	Louisiana	Ouachita	0.000510976	TON	
22073	Louisiana	Ouachita	4.84E-08	TON	
22073	Louisiana	Ouachita	0.000108043	TON	
22073	Louisiana	Ouachita	0.000484082	TON	
22079	Louisiana	Rapides	1.27E-05	TON	107
22079	Louisiana	Rapides	2.67E-05	TON	107
22079	Louisiana	Rapides	1.95E-05	TON	107
22079	Louisiana	Rapides	0.000282825	TON	107
22079	Louisiana	Rapides	1.61E-05	TON	107
22079	Louisiana	Rapides	7.08E-07	TON	
22079	Louisiana	Rapides	2.06E-05	TON	1807-2
22079	Louisiana	Rapides	0.000441659	TON	
22079	Louisiana	Rapides	6.23E-07	TON	1640
22079	Louisiana	Rapides	4.18E-08	TON	
22079	Louisiana	Rapides	0.000205282	TON	
22079	Louisiana	Rapides	0.000418413	TON	
22081	Louisiana	Red River	2.23E-06	TON	107
22081	Louisiana	Red River	4.70E-06	TON	107
22081	Louisiana	Red River	3.43E-06	TON	107
22081	Louisiana	Red River	9.29E-06	TON	107
22081	Louisiana	Red River	5.28E-07	TON	107
22081	Louisiana	Red River	1.08E-08	TON	
22081	Louisiana	Red River	1.54E-06	TON	1807-2
22081	Louisiana	Red River	3.13E-09	TON	
22081	Louisiana	Red River	3.13E-05	TON	

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22083	Louisiana	Richland	1.79E-06	TON	107
22083	Louisiana	Richland	3.77E-06	TON	107
22083	Louisiana	Richland	2.76E-06	TON	107
22083	Louisiana	Richland	3.17E-05	TON	107
22083	Louisiana	Richland	1.80E-06	TON	107
22083	Louisiana	Richland	2.49E-07	TON	
22083	Louisiana	Richland	3.42E-06	TON	1807-2
22083	Louisiana	Richland	8.59E-08	TON	1640
22083	Louisiana	Richland	6.96E-09	TON	
22083	Louisiana	Richland	6.96E-05	TON	
22107	Louisiana	Tensas	2.93E-07	TON	107
22107	Louisiana	Tensas	6.16E-07	TON	107
22107	Louisiana	Tensas	4.50E-07	TON	107
22107	Louisiana	Tensas	5.82E-06	TON	107
22107	Louisiana	Tensas	3.31E-07	TON	107
22107	Louisiana	Tensas	2.70E-08	TON	
22107	Louisiana	Tensas	1.06E-06	TON	1807-2
22107	Louisiana	Tensas	2.28E-05	TON	
22107	Louisiana	Tensas	2.16E-09	TON	
22107	Louisiana	Tensas	2.16E-05	TON	
22111	Louisiana	Union	2.15E-06	TON	107
22111	Louisiana	Union	4.51E-06	TON	107
22111	Louisiana	Union	3.30E-06	TON	107
22111	Louisiana	Union	1.68E-05	TON	107
22111	Louisiana	Union	9.54E-07	TON	107
22111	Louisiana	Union	1.57E-07	TON	
22111	Louisiana	Union	3.60E-06	TON	1807-2
22111	Louisiana	Union	7.72E-05	TON	
22111	Louisiana	Union	7.32E-09	TON	
22111	Louisiana	Union	7.32E-05	TON	
22119	Louisiana	Webster	7.94E-06	TON	107
22119	Louisiana	Webster	1.67E-05	TON	107
22119	Louisiana	Webster	1.22E-05	TON	107
22119	Louisiana	Webster	5.36E-05	TON	107
22119	Louisiana	Webster	3.05E-06	TON	107
22119	Louisiana	Webster	6.95E-06	TON	1807-2
22119	Louisiana	Webster	0.000149096	TON	
22119	Louisiana	Webster	1.41E-08	TON	
22119	Louisiana	Webster	0.000205282	TON	
22119	Louisiana	Webster	0.000141249	TON	
22123	Louisiana	W. Carroll	6.40E-07	TON	107
22123	Louisiana	W. Carroll	1.35E-06	TON	107
22123	Louisiana	W. Carroll	9.84E-07	TON	107
22123	Louisiana	W. Carroll	1.03E-05	TON	107
22123	Louisiana	W. Carroll	5.83E-07	TON	107
22123	Louisiana	W. Carroll	3.24E-07	TON	
22123	Louisiana	W. Carroll	1.98E-06	TON	1807-2
22123	Louisiana	W. Carroll	4.24E-05	TON	
22123	Louisiana	W. Carroll	4.02E-09	TON	
22123	Louisiana	W. Carroll	4.02E-05	TON	
22127	Louisiana	Winn	4.48E-06	TON	107

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22127	Louisiana	Winn	9.42E-06	TON	107
22127	Louisiana	Winn	6.88E-06	TON	107
22127	Louisiana	Winn	2.07E-05	TON	107
22127	Louisiana	Winn	1.18E-06	TON	107
22127	Louisiana	Winn	1.46E-07	TON	
22127	Louisiana	Winn	2.84E-06	TON	1807-2
22127	Louisiana	Winn	8.59E-08	TON	1640
22127	Louisiana	Winn	5.78E-09	TON	
22127	Louisiana	Winn	5.78E-05	TON	
28001	Mississippi	Adams	7.27E-06	TON	107
28001	Mississippi	Adams	1.53E-05	TON	107
28001	Mississippi	Adams	1.12E-05	TON	107
28001	Mississippi	Adams	6.53E-05	TON	107
28001	Mississippi	Adams	3.71E-06	TON	107
28001	Mississippi	Adams	1.45E-07	TON	
28001	Mississippi	Adams	3.65E-06	TON	1807-2
28001	Mississippi	Adams	0.000117254	TON	
28001	Mississippi	Adams	1.00E-07	TON	1640
28001	Mississippi	Adams	1.11E-08	TON	
28001	Mississippi	Adams	0.000205282	TON	
28001	Mississippi	Adams	0.000111083	TON	
28011	Mississippi	Bolivar	9.18E-06	TON	107
28011	Mississippi	Bolivar	1.93E-05	TON	107
28011	Mississippi	Bolivar	1.41E-05	TON	107
28011	Mississippi	Bolivar	5.18E-05	TON	107
28011	Mississippi	Bolivar	2.95E-06	TON	107
28011	Mississippi	Bolivar	6.44E-08	TON	
28011	Mississippi	Bolivar	4.31E-06	TON	1807-2
28011	Mississippi	Bolivar	0.000138746	TON	
28011	Mississippi	Bolivar	1.31E-08	TON	
28011	Mississippi	Bolivar	0.000205282	TON	
28011	Mississippi	Bolivar	0.000131443	TON	
28021	Mississippi	Claiborne	3.71E-06	TON	107
28021	Mississippi	Claiborne	7.80E-06	TON	107
28021	Mississippi	Claiborne	5.70E-06	TON	107
28021	Mississippi	Claiborne	9.58E-06	TON	107
28021	Mississippi	Claiborne	5.45E-07	TON	107
28021	Mississippi	Claiborne	2.82E-08	TON	
28021	Mississippi	Claiborne	1.26E-06	TON	1807-2
28021	Mississippi	Claiborne	3.83E-09	TON	
28021	Mississippi	Claiborne	3.83E-05	TON	
28027	Mississippi	Coahoma	5.03E-06	TON	107
28027	Mississippi	Coahoma	1.06E-05	TON	107
28027	Mississippi	Coahoma	7.74E-06	TON	107
28027	Mississippi	Coahoma	6.34E-05	TON	107
28027	Mississippi	Coahoma	3.61E-06	TON	107
28027	Mississippi	Coahoma	1.13E-07	TON	
28027	Mississippi	Coahoma	3.37E-06	TON	1807-2
28027	Mississippi	Coahoma	2.65E-07	TON	1640
28027	Mississippi	Coahoma	1.03E-08	TON	
28027	Mississippi	Coahoma	0.000205282	TON	

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28027	Mississippi	Coahoma	0.000102624	TON	
28053	Mississippi	Humphreys	3.63E-06	TON	107
28053	Mississippi	Humphreys	7.63E-06	TON	107
28053	Mississippi	Humphreys	5.57E-06	TON	107
28053	Mississippi	Humphreys	1.12E-05	TON	107
28053	Mississippi	Humphreys	6.36E-07	TON	107
28053	Mississippi	Humphreys	1.21E-06	TON	1807-2
28053	Mississippi	Humphreys	3.91E-05	TON	
28053	Mississippi	Humphreys	3.70E-09	TON	
28053	Mississippi	Humphreys	3.70E-05	TON	
28055	Mississippi	Issaquena	5.74E-08	TON	107
28055	Mississippi	Issaquena	1.21E-07	TON	107
28055	Mississippi	Issaquena	8.83E-08	TON	107
28055	Mississippi	Issaquena	1.04E-06	TON	107
28055	Mississippi	Issaquena	5.93E-08	TON	107
28055	Mississippi	Issaquena	2.42E-08	TON	
28055	Mississippi	Issaquena	1.77E-07	TON	1807-2
28055	Mississippi	Issaquena	5.70E-06	TON	
28055	Mississippi	Issaquena	5.40E-10	TON	
28055	Mississippi	Issaquena	5.40E-06	TON	
28063	Mississippi	Jefferson	6.75E-07	TON	107
28063	Mississippi	Jefferson	1.42E-06	TON	107
28063	Mississippi	Jefferson	1.04E-06	TON	107
28063	Mississippi	Jefferson	5.76E-06	TON	107
28063	Mississippi	Jefferson	3.28E-07	TON	107
28063	Mississippi	Jefferson	9.08E-07	TON	1807-2
28063	Mississippi	Jefferson	2.77E-09	TON	
28063	Mississippi	Jefferson	2.77E-05	TON	
28125	Mississippi	Sharkey	5.31E-07	TON	107
28125	Mississippi	Sharkey	1.12E-06	TON	107
28125	Mississippi	Sharkey	8.16E-07	TON	107
28125	Mississippi	Sharkey	7.57E-06	TON	107
28125	Mississippi	Sharkey	4.31E-07	TON	107
28125	Mississippi	Sharkey	7.09E-07	TON	1807-2
28125	Mississippi	Sharkey	2.28E-05	TON	
28125	Mississippi	Sharkey	2.16E-09	TON	
28125	Mississippi	Sharkey	2.16E-05	TON	
28133	Mississippi	Sunflower	8.75E-06	TON	107
28133	Mississippi	Sunflower	1.84E-05	TON	107
28133	Mississippi	Sunflower	1.34E-05	TON	107
28133	Mississippi	Sunflower	3.32E-05	TON	107
28133	Mississippi	Sunflower	1.89E-06	TON	107
28133	Mississippi	Sunflower	1.01E-07	TON	
28133	Mississippi	Sunflower	3.60E-06	TON	1807-2
28133	Mississippi	Sunflower	0.000115861	TON	
28133	Mississippi	Sunflower	1.10E-08	TON	
28133	Mississippi	Sunflower	0.000109763	TON	
28149	Mississippi	Warren	1.30E-05	TON	107
28149	Mississippi	Warren	2.73E-05	TON	107
28149	Mississippi	Warren	1.99E-05	TON	107
28149	Mississippi	Warren	0.000109588	TON	107

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28149	Mississippi	Warren	6.23E-06	TON	107
28149	Mississippi	Warren	1.97E-07	TON	
28149	Mississippi	Warren	5.32E-06	TON	1807-2
28149	Mississippi	Warren	0.000171222	TON	
28149	Mississippi	Warren	1.43E-08	TON	1640
28149	Mississippi	Warren	1.62E-08	TON	
28149	Mississippi	Warren	0.000205282	TON	
28149	Mississippi	Warren	0.00016221	TON	
28151	Mississippi	Washington	1.54E-05	TON	107
28151	Mississippi	Washington	3.25E-05	TON	107
28151	Mississippi	Washington	2.37E-05	TON	107
28151	Mississippi	Washington	0.00010429	TON	107
28151	Mississippi	Washington	5.93E-06	TON	107
28151	Mississippi	Washington	1.21E-07	TON	
28151	Mississippi	Washington	6.96E-06	TON	1807-2
28151	Mississippi	Washington	0.000223886	TON	
28151	Mississippi	Washington	1.00E-07	TON	1640
28151	Mississippi	Washington	2.12E-08	TON	
28151	Mississippi	Washington	0.000212103	TON	
48037	Texas	Bowie	1.30E-05	TON	107
48037	Texas	Bowie	2.74E-05	TON	107
48037	Texas	Bowie	2.00E-05	TON	107
48037	Texas	Bowie	2.41E-05	TON	107
48037	Texas	Bowie	0.000201324	TON	107
48037	Texas	Bowie	1.14E-05	TON	107
48037	Texas	Bowie	1.22E-07	TON	
48037	Texas	Bowie	1.76E-05	TON	1807-2
48037	Texas	Bowie	0.000290929	TON	
48037	Texas	Bowie	2.51E-07	TON	1640
48037	Texas	Bowie	2.76E-08	TON	
48037	Texas	Bowie	0.000108043	TON	
48037	Texas	Bowie	0.000275617	TON	
48067	Texas	Cass	2.77E-06	TON	107
48067	Texas	Cass	5.83E-06	TON	107
48067	Texas	Cass	4.26E-06	TON	107
48067	Texas	Cass	4.60E-06	TON	107
48067	Texas	Cass	3.27E-05	TON	107
48067	Texas	Cass	1.86E-06	TON	107
48067	Texas	Cass	5.41E-08	TON	
48067	Texas	Cass	6.47E-06	TON	1807-2
48067	Texas	Cass	0.000106674	TON	
48067	Texas	Cass	8.59E-08	TON	1640
48067	Texas	Cass	1.01E-08	TON	
48067	Texas	Cass	0.000205282	TON	
48067	Texas	Cass	0.00010106	TON	
48315	Texas	Marion	1.19E-06	TON	107
48315	Texas	Marion	2.49E-06	TON	107
48315	Texas	Marion	1.82E-06	TON	107
48315	Texas	Marion	8.77E-07	TON	107
48315	Texas	Marion	8.39E-06	TON	107
48315	Texas	Marion	4.77E-07	TON	107

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48315	Texas	Marion	3.81E-08	TON	
48315	Texas	Marion	2.32E-06	TON	1807-2
48315	Texas	Marion	3.63E-09	TON	
48315	Texas	Marion	3.63E-05	TON	

## **APPENDIX C**

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### **Ouachita River Basin Precipitation**

1999 - 2002 monthly total precip data in Ouachita River basin (inches)

STATION	Station #	HUC	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
CALION LOCK & DAM	1140	8040201	1999	9.23	0.79	3.95	6.05	3.42	7.04	1.70	2.25	0.89	2.55	0.45	2.45	40.77
CALION LOCK & DAM	1140	8040201	2000	2.07	1.73	5.71	5.07	6.86	4.94	0.79	2.00	4.13	1.16	9.12	6.40	48.18
CALION LOCK & DAM	1140	8040201	2001	5.47	10.37	--	1.95	9.63	4.05	1.55	4.42	2.58	7.23	5.32	11.14	63.71
CALION LOCK & DAM	1140	8040201	2002	3.60	2.08	8.36	1.82	6.32	2.02	4.37	3.97	1.79	4.23	3.64	11.44	53.64
FORDYCE	2540	8040201	1999	8.23	1.11	7.61	5.32	4.88	5.70	1.16	2.06	0.74	2.08	3.10	3.68	45.67
FORDYCE	2540	8040201	2000	2.78	3.57	6.73	3.08	7.93	4.25	0.39	0.67	3.60	0.45	12.07	7.24	52.76
FORDYCE	2540	8040201	2001	4.98	9.19	4.86	4.49	10.39	4.43	3.65	5.92	2.37	7.42	5.86	9.58	73.14
FORDYCE	2540	8040201	2002	2.45	2.59	10.29	2.72	13.13	2.64	4.23	4.34	4.31	3.29	2.91	9.62	62.52
HAMPTON 5 SE	3101	8040201	1999	10.26	1.40	5.48	6.38	5.36	7.80	3.52	1.43	1.39	1.90	1.19	3.65	49.76
HAMPTON 5 SE	3101	8040201	2000	2.11	2.23	7.64	6.20	6.66	5.26	1.88	0.15	4.85	0.89	11.35	6.70	55.92
HAMPTON 5 SE	3101	8040201	2001	6.05	10.69	7.23	3.71	9.33	4.73	3.39	4.99	2.64	3.75	4.93	9.32	10.60
HAMPTON 5 SE	3101	8040201	2002	3.13	2.56	9.96	2.29	10.74	3.07	4.94	2.64	2.82	3.75	4.93	8.90	59.73
		AVERAGE	5.03	4.03	7.07	4.09	7.89	4.66	2.76	2.62	2.70	3.79	5.60	7.62	57.27	1.45 m
CROSSETT 2 SSE	1730	8040202	1999	15.72	1.75	3.73	3.76	5.53	4.88	1.42	2.23	1.94	0.91	1.76	2.51	46.14
CROSSETT 2 SSE	1730	8040202	2000	3.34	1.53	7.45	7.41	7.36	4.48	0.80	0.22	3.24	1.62	8.57	8.54	54.56
CROSSETT 2 SSE	1730	8040202	2001	7.18	10.45	6.67	3.33	5.68	3.90	1.79	6.04	3.52	5.24	8.73	11.04	73.57
CROSSETT 2 SSE	1730	8040202	2002	7.56	3.09	8.48	3.10	5.35	2.61	3.45	0.89	6.35	4.20	8.16	54.54	
STERLINGTON	8785	8040202	1999	15.77	0.83	5.99	5.81	1.67	6.97	2.58	0.00	3.53	1.24	0.72	3.97	49.08
STERLINGTON	8785	8040202	2000	2.26	1.18	6.92	7.46	7.48	6.41	1.63	0.72	1.15	1.15	11.22	6.46	54.06
STERLINGTON	8785	8040202	2001	7.74	8.74	9.03	2.95	6.41	5.71	2.45	5.09	2.29	2.66	6.52	10.63	70.22
STERLINGTON	8785	8040202	2002	9.97	2.95	8.68	3.13	2.65	2.35	3.90	5.49	1.73	6.29	3.73	6.29	57.16
FELSENTHAL	2475	8040202	1999	17.36	0.73	3.96	3.88	4.06	10.09	2.54	3.60	0.60	1.42	1.34	4.21	53.79
FELSENTHAL	2475	8040202	2000	2.97	2.20	7.40	7.62	7.48	3.44	2.03	0.56	2.17	2.19	8.47	8.48	55.01
FELSENTHAL	2475	8040202	2001	7.37	10.26	7.79	3.65	4.62	5.93	0.97	4.61	2.37	5.67	8.61	11.34	73.19
FELSENTHAL	2475	8040202	2002	6.81	2.75	9.75	2.76	6.08	1.84	4.11	2.79	2.35	5.19	4.41	9.80	58.64
		AVERAGE	8.67	3.87	7.15	4.57	5.36	4.78	2.24	2.90	2.15	3.33	5.69	7.62	58.33	1.48 m
ALUM FORK	130	8040203	1999	8.21	1.55	6.08	6.74	6.44	3.02	3.18	2.02	2.17	4.50	2.75	4.16	50.82
ALUM FORK	130	8040203	2000	2.71	2.27	3.40	3.15	5.44	9.86	0.36	0.59	2.54	0.96	11.90	3.52	46.70
ALUM FORK	130	8040203	2001	3.38	8.34	3.84	1.28	7.15	2.36	5.33	1.20	4.83	3.43	4.53	7.63	53.30
BENTON	582	8040203	1999	8.35	3.07	8.85	2.25	4.50	0.63	4.47	3.17	5.09	2.29	9.71	49.49	
BENTON	582	8040203	2000	1.13	1.25	5.41	6.88	3.35	4.05	2.52	1.48	2.02	2.53	4.16	4.75	46.75
BENTON	582	8040203	2001	2.41	3.18	3.18	3.29	5.88	7.02	0.70	0.31	1.93	2.00	9.19	3.99	41.03
BENTON	582	8040203	2002	3.91	7.87	3.85	2.70	6.31	2.90	3.42	4.59	1.52	5.45	4.99	6.06	52.45
SHERIDAN	6562	8040203	1999	6.07	1.58	9.81	6.32	4.17	4.40	0.56	0.62	1.64	3.76	5.47	2.27	6.33
SHERIDAN	6562	8040203	2000	1.32	2.54	4.38	3.04	6.30	5.85	0.26	0.40	2.90	0.42	9.95	3.82	44.79
SHERIDAN	6562	8040203	2001	4.24	8.31	4.52	3.62	6.19	3.62	3.87	0.40	2.67	8.32	5.12	7.60	60.25
SHERIDAN	6562	8040203	2002	2.52	2.88	13.19	2.10	7.62	3.86	4.40	0.93	1.92	5.03	2.80	9.82	57.07
		AVERAGE	3.98	3.65	6.34	3.55	5.67	4.00	2.64	1.83	2.52	3.74	5.31	5.98	49.22	1.25 m
MONTICELLO 3 SW	4900	8040204	1999	15.21	1.34	5.79	5.59	3.87	4.70	0.97	1.52	1.93	1.53	3.42	4.85	50.72
MONTICELLO 3 SW	4900	8040204	2000	1.70	3.06	2.93	5.06	7.02	4.80	0.60	0.37	2.79	0.37	11.07	4.93	44.70
MONTICELLO 3 SW	4900	8040204	2001	5.50	12.85	8.68	5.27	3.97	2.73	--	3.23	9.53	7.26	6.47	65.83	
MONTICELLO 3 SW	4900	8040204	2002	6.72	2.35	12.08	2.39	0.00	0.00	--	2.32	0.98	0.05	0.90	7.55	35.34
WARREN 2 WSW	7582	8040204	1999	13.16	1.09	6.28	5.66	4.86	6.21	1.21	0.67	2.13	2.53	3.38	49.70	
WARREN 2 WSW	7582	8040204	2000	1.79	2.03	6.35	6.65	7.50	3.88	0.54	0.91	2.67	0.69	12.40	6.62	52.03
WARREN 2 WSW	7582	8040204	2001	5.87	10.42	5.80	3.63	7.02	4.74	1.46	5.85	2.19	7.36	8.10	11.86	74.30
WARREN 2 WSW	7582	8040204	2002	3.73	2.56	11.53	2.55	11.65	1.98	1.97	5.22	2.07	5.16	2.37	9.49	60.28
		AVERAGE	5.86	4.59	7.59	4.19	5.94	3.59	1.96	2.37	2.02	4.03	5.57	7.14	54.49	
HAMBURG	3088	8040205	1999	8.24	1.17	--	3.29	--	9.47	0.00	1.55	0.61	2.41	--	--	26.74
HAMBURG	3088	8040205	2000	3.29	1.24	6.65	--	6.43	5.61	1.99	0.12	--	--	8.17	8.45	43.44
HAMBURG	3088	8040205	2001	7.87	11.89	5.71	3.45	--	--	--	--	--	6.45	--	--	40.98
HAMBURG	3088	8040205	2002	6.42	6.42	3.30	1.50	2.53	5.41	5.14	7.65	0.65	--	--	--	36.09

1999 - 2002 monthly total precip data in Ouachita River basin (inches)

STATION	Station #	HUC	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
PINE BLUFF	5754	8040205	1999	6.84	1.01	6.70	4.48	4.25	2.63	2.33	0.05	1.26	3.17	2.89	4.51	40.12
PINE BLUFF	5754	8040205	2000	1.56	2.13	5.97	9.01	5.72	1.36	0.00	2.52	1.04	7.47	2.22	40.70	
PINE BLUFF	5754	8040205	2001	4.74	6.08	3.79	3.22	5.56	2.36	2.76	4.29	--	6.50	6.06	7.53	52.89
PINE BLUFF	5754	8040205	2002	2.25	2.63	13.74	0.97	4.71	0.89	1.01	1.96	3.10	8.89	2.97	10.52	53.64
BASTROP	537	8040205	1999	14.88	0.98	7.09	6.55	--	7.00	1.16	0.68	5.13	1.24	1.09	4.14	49.94
BASTROP	537	8040205	2000	--	1.41	11.34	6.69	8.14	5.01	1.00	0.29	2.11	1.35	6.83	5.31	49.48
BASTROP	537	8040205	2001	--	--	--	--	--	--	--	--	--	2.38	8.15	9.89	20.42
BASTROP	537	8040205	2002	9.88	2.55	9.93	3.47	3.83	2.72	2.45	5.49	3.01	7.25	4.76	6.81	62.15
		AVERAGE	6.60	3.14	7.30	3.66	5.56	4.83	1.92	2.21	2.30	4.07	5.38	6.60	43.05	1.09 m
CALHOUN RESEARCH STI	1411	8040207	1999	16.68	0.61	6.26	5.04	2.04	5.26	1.72	0.54	2.73	2.74	0.69	3.95	48.26
CALHOUN RESEARCH STI	1411	8040207	2000	2.56	2.06	8.58	6.67	6.50	5.28	1.36	0.93	2.49	1.91	9.91	6.76	55.01
CALHOUN RESEARCH STI	1411	8040207	2001	6.27	9.29	11.06	3.66	4.61	6.89	2.25	2.73	5.63	4.03	8.00	10.57	74.99
CALHOUN RESEARCH STI	1411	8040207	2002	7.36	3.34	5.78	3.53	1.74	2.51	4.30	2.85	1.91	8.68	5.62	7.54	55.16
COLUMBIA LOCKS	1979	8040207	1999	13.02	1.47	7.47	7.07	2.25	12.14	3.08	0.00	4.29	2.63	0.84	4.52	58.78
COLUMBIA LOCKS	1979	8040207	2000	2.85	2.20	7.53	9.22	4.78	7.54	2.90	0.00	1.95	0.37	9.89	4.27	53.50
COLUMBIA LOCKS	1979	8040207	2001	6.45	4.60	8.38	1.81	1.52	4.90	1.08	4.59	3.14	5.78	9.45	7.48	59.18
COLUMBIA LOCKS	1979	8040207	2002	3.77	3.77	4.41	3.45	3.90	8.59	2.29	4.79	2.92	8.64	4.24	10.23	61.00
MONROE NLU	6314	8040207	1999	17.26	1.19	6.78	6.65	3.18	10.39	4.94	0.98	2.29	1.88	0.84	4.49	60.87
MONROE NLU	6314	8040207	2000	1.47	1.34	8.49	7.49	6.11	5.53	2.20	0.04	2.09	0.85	10.45	4.45	50.51
MONROE NLU	6314	8040207	2001	5.26	8.12	8.43	4.93	2.14	4.42	4.99	2.51	3.90	5.06	7.80	9.94	67.50
MONROE NLU	6314	8040207	2002	5.55	3.56	7.08	3.05	1.51	3.71	2.64	3.41	3.18	8.14	3.42	6.96	52.21
STERLINGTON #2	8788	8040207	1999	14.09	0.80	7.24	6.06	3.32	8.94	1.82	1.94	4.86	1.38	3.94	55.18	
STERLINGTON #2	8788	8040207	2000	2.28	1.56	7.42	7.97	6.84	6.55	0.90	2.11	1.47	1.67	8.17	6.25	53.19
STERLINGTON #2	8788	8040207	2001	6.11	6.47	10.03	3.64	6.74	4.08	2.21	5.63	3.42	3.25	7.66	10.48	69.72
STERLINGTON #2	8788	8040207	2002	8.45	2.76	5.28	5.91	2.32	2.13	1.12	--	--	--	--	--	
		AVERAGE	7.21	3.15	7.38	5.60	3.72	6.58	2.51	2.36	3.05	3.60	5.78	6.64	58.33	1.48 m
		OUACHITA RIVER BASIN AVERAGE	6.23	3.74	7.14	4.28	5.69	4.74	2.34	2.38	2.46	3.76	5.55	6.93	53.45	1.36 m